Alaska LNG

DOCKET NO. PF14-21-000
DRAFT RESOURCE REPORT NO. 9
AIR AND NOISE QUALITY
PUBLIC VERSION

Document Number: USAKE-PT-SRREG-00-0009

RESOURCE REPORT NO. 9 SUMMARY OF FILING INFORMATION [1]	
Filing Requirement	**Found in Section**
Describe existing air quality in the vicinity of the project. (§ 380.12(k)(1)) • Identify criteria pollutants that may be emitted above EPA-identified significance levels.	9.2.1, 9.2.2
Quantify the existing noise levels (day-night sound level (L_{dn}) and other applicable noise parameters) at noise-sensitive areas and at other areas covered by relevant state and local noise ordinances. (§ 380.12(k)(2)) • If new compressor station sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and activities. • For existing compressor stations (operated at full load), include the results of a sound level survey at the site property line and nearby noise-sensitive areas. • Include a plot plan that identifies the locations and duration of noise measurements. • All surveys must identify the time of day, weather conditions, wind speed and direction,	9.4.2.2 (pending determination of compressor station locations)
Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NO_x) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. (§ 380.12(k)(3)) • Provide the emission rate of NO_x from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rate, and annual hours of operation.	To be provided in a subsequent draft
Describe the existing compressor units at each station where new, additional, or modified compressor units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed new, additional, or modified compressor units include the horsepower, type, and energy source. (§ 380.12(k)(4))	To be provided in a subsequent draft
Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure. (§ 380.12(k)(4))	9.4.2.2 (pending determination of compressor station locations)
Identify any applicable state or local noise regulations. (§ 380.12(k)(4)) • Specify how the facility will meet the regulations.	9.4.1
Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer's data and proposed noise control equipment. (§ 380.12(k)(4))	9.4.4 (pending determination of compressor station locations)
Additional Information Often Missing and Resulting in Data Requests	
Provide copies of application for state air permits and agency determinations, as appropriate.	To be provided in a subsequent draft
For major sources of air emissions (as defined by the EPA), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	To be provided in a subsequent draft

[1] Per August 2002 FERC Guidance Manual for Environmental Report Preparation – available at: http://www.ferc.gov/industries/gas/enviro/erpman.pdf.

RESOURCE REPORT NO. 9 **SUMMARY OF FILING INFORMATION** [1]	
Filing Requirement	**Found in Section**
Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and building, and orientation of equipment away from noise-sensitive areas.	Draft 2 ER

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ACRONYMS AND ABBREVIATIONS

ABBREVIATION	DEFINITION
Abbreviations for Units of Measurement	
°C	degrees Celsius
°F	degrees Fahrenheit
BSCF/D	billion standard cubic feet per day
cfs	cubic feet per second
cm	centimeters
dB	decibels
dBA	A-weighted decibels
ft	feet
g	grams
gpm	gallons per minute
ha	hectare
hp	horsepower
Hz	hertz
in	inches
kg	kilogram
kHz	kilohertz
kW	kilowatts
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
m^3	cubic meters
Ma	mega-annum (millions of years)
mg	milligrams
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MGD	million gallons per day
mm	millimeters
MMBtu/hr	million British thermal units per hour
MMSCF/D	million standard cubic feet per day
MPH	miles per hour
MMTA	million metric tons per annum
ng	nanograms
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
ppmv	parts per million by volume
Psig	pounds per square inch gauge
rms	root mean square
SPL	sound pressure level
tpy	tons per year

ABBREVIATION	DEFINITION
µg	microgram
µg/kg	micrograms per kilogram
µPa	micropascals
Other Abbreviations	
§	section or paragraph
AAAQS	Alaska Ambient Air Quality Standards
AAC	Alaska Administrative Code
ACC	Alaska Conservation Corps
ACEC	Areas of Critical Environmental Concern
ACP	Arctic Coastal Plain
ACRC	Alaska Climate Research Center
ACS	U.S. Census, American Community Survey
AD	aggregate dock
ADCCED	Alaska Department of Commerce, Community, and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADGGS	Alaska Division of Geological and Geophysical Surveys
ADM	average daily membership
ADNR	Alaska Department of Natural Resources
ADOLWD	Alaska Department of Labor and Workforce Development
ADOT&PF	Alaska Department of Transportation and Public Facilities
AEIC	Alaska Earthquake Information Center
AES	Arctic Slope Regional Corporation Energy Service
AGDC	Alaska Gasline Development Corporation
AGPPT	Alaska Gas Producers Pipeline Team
AHPA	Alaska Historic Preservation Act
AHRS	Alaska Heritage Resources Survey
AIDEA	Alaska Industrial Development and Export Authority
AKNHP	Alaska Natural Heritage Program
AMP	approximate mile post
ANCSA	Alaska Native Claims Settlement Act
ANGPA	Alaska Natural Gas Pipeline Act
ANGTS	Alaska Natural Gas Transportation System
ANILCA	Alaska National Interest Lands Conservation Act
ANIMIDA	Arctic Nearshore Impact Monitoring in the Development Area
ANS Task Force	Aquatic Nuisance Species Task Force
ANVSA	Alaska Native Village Statistical Area
AOGCC	Alaska Oil and Gas Conservation Commission
AOI	Area of Interest
APCI	Air Products and Chemicals Inc.
APDES	Alaska Pollutant Discharge Elimination System
APE	Area of Potential Effect
API	American Petroleum Institute
APP	Alaska Pipeline Project

ABBREVIATION	DEFINITION
Applicants	ExxonMobil Alaska LNG LLC, ConocoPhillips Alaska LNG Company, BP Alaska LNG LLC, TransCanada Alaska Midstream LP, and Alaska Gasline Development Corporation
APSC	Alyeska Pipeline Service Company
AQRV	Air Quality Related Value
Arctic NWR	Arctic National Wildlife Refuge
ARD	acid rock drainage
ARDF	Alaska Resource Data File
ARPA	Archaeological Resources Protection Act of 1979
ARRC	Alaska Railroad Corporation
AS	Alaska Statute
ASAP	Alaska Stand Alone Pipeline
ASME	American Society of Mechanical Engineers
ASOS	Automated Surface Observation System
ASRC	Arctic Slope Regional Corporation
ATC	Allakaket Tribal Council
ATWS	additional temporary workspace
AWOS	Automated Weather Observing System
B.C.	British Columbia
BACT	Best Available Control Technology
BGEPA	Bald and Golden Eagle Protection Act
BIA	U.S. Department of the Interior, Bureau of Indian Affairs
BLM	U.S. Department of the Interior, Bureau of Land Management
BMP	best management practices
BOD_5	biochemical oxygen demand
BOEM	U.S. Department of the Interior, Bureau of Ocean Energy Management
BOG	boil-off gas
BP	Before Present
C.F.R.	Code of Federal Regulations
CAA	Clean Air Act
CAMA	Central Arctic Management Area
CCP	Comprehensive Conservation Plans
CDP	Census Designated Place
CEA	Chugach Electric Association
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGF	Central Gas Facility
CGP	Construction General Permit
CH_4	methane
CHA	Critical Habitat Area
CIRCAC	Cook Inlet Regional Citizens Advisory Council
CIRI	Cook Inlet Region Inc.
CLG	Certified Local Government
CO	carbon monoxide

ABBREVIATION	DEFINITION
CO_2	carbon dioxide
CO_2e	total greenhouse gas emissions, in CO_2-equivalent global warming potential
COC	Certificate of Compliance
CONUS	Continental U.S.
COOP	National Weather Service, Cooperative Observer Program
CPCN	Certificate of Public Convenience and Necessity
CRA	Certificate of Reasonable Assurance
CSD	Contaminated Sites Database
CSP	Contaminated Sites Program
CSU	conservation system units
CV	coefficient of variation
CWA	Clean Water Act
DB	Denali Borough
DEM	Digital Elevation Model
DGGS	ADNR Division of Geological and Geophysical Surveys
DH	dock head
DHSS	Alaska Department of Health and Social Services
DMLW	Alaska Department of Natural Resources, Division of Mining, Land, and Water
DPS	Distinct Population Segment
DWPP	Drinking Water Protection Program
EDA	U.S. Department of Commerce, Economic Development Administration
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPRP	Emergency Preparedness and Response Plan
ERL	Environmental, Regulatory and Lands
ERMA	Extended Recreation Management Areas
ESA	Endangered Species Act
ESD	Emergency Shut Down
ESU	Evolutionary Significant Unit
FAA	U.S. Department of Transportation, Federal Aviation Administration
FCC	Federal Communications Commission
FE	U.S. Department of Energy, Office of Fossil Energy
FEED	front-end engineering design
FEIS	Final Environmental Impact Statement
FEMA	U.S. Department of Homeland Security, Federal Emergency Management Agency
FERC	U.S. Department of Energy, Federal Energy Regulatory Commission
FERC Plan	FERC Erosion Control, Revegetation, and Maintenance Plan
FERC Procedures	FERC Wetland and Waterbody Construction and Mitigation Procedures
FLPMA	Federal Land Policy and Management Act (of 1976) BLM
FMP	Fisheries Management Plan

ABBREVIATION	DEFINITION
FNSB	Fairbanks North Star Borough
FR	Federal Regulation
GDP	Gross Domestic Product
GHG	greenhouse gases
GIS	geographic information system
GMU	Game Management Units
GP	General Permit
GRI	Gas Research Institute
GTP	gas treatment plant
GWP	Global Warming Potential
H_2S	hydrogen sulfide
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HAP	Hazardous Air Pollutant
HAPC	Habitat Areas of Particular Concern
HCA	High Consequence Area
HDD	horizontal directional drill
HDMS	Hazard Detection and Mitigation System
HGM	hydrogeomorphic
HLV	heavy lift vessel
HMR	Hazardous Materials Regulations
HRS	Hazard Ranking System
IBA	Important Bird Areas
ICS	Incident Command System
IHA	Incidental Harassment Authorization
IHLC	Inupiat History, Language, and Culture
ILI	In-line Inspection
IMP	Integrity Management Plan
IP	Individual Permit
ISO	International Organization for Standardization
JPO	State and Federal Joint Pipeline Office
kbpd	thousand barrels per day
KCC	Kuparuk Construction Camp
KOP	key observation points
KPB	Kenai Peninsula Borough
KTC	Kuparuk Transportation Company
LiDAR	light detection and ranging
Liquefaction Facility	natural gas liquefaction
LLC	Limited Liability Company
LNG	liquefied natural gas
LNGC	liquefied natural gas carrier
LOA	Letter of Authorization
LOD	Limits of Distribution

ABBREVIATION	DEFINITION
LP	Limited Partnership
LPG	liquefied petroleum gas
LUP	Land Use Permit
LUST	Leaking Underground Storage Tanks
MACT	maximum achievable control technology
Mainline	An approximately 800-mile-long, large-diameter gas pipeline
MAOP	maximum allowable operating pressure
MARPOL	Marine Pollution Protocol
MBTA	Migratory Bird Treaty Act
MCD	marine construction dock
MHHW	mean higher high water
MHW	mean high water
ML&P	Anchorage Municipal Light and Power
MLA	Mineral Leasing Act
MLBV	Mainline block valve
MLLW	mean lower low water
MLW	mean low water
MMPA	Marine Mammal Protection Act
MMS	Mainline Meter Station
MOE	margin of error
MOF	material offloading facility
MP	Mainline milepost
MPRSA	Marine Protection Research and Sanctuaries Act of 1972
MSB	Matanuska-Susitna Borough
MSCFD	Thousand standard cubic feet per day
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAS	nonindigenous aquatic species
NCC	national certification corporation
NCDC	National Climatic Data Center
NDE	non-destructive examination
NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFIP	National Flood Insurance Program
NGA	Natural Gas Act
NHPA	National Historic Preservation Act of 1996, as amended
NID	Negligible Impact Determination
NLURA	Northern Land Use Research Alaska, LLC
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NOAA	National Oceanographic and Atmospheric Administration

ABBREVIATION	DEFINITION
NOI	Notice of Intent
North Slope	Alaska North Slope
NPDES	National Pollutant Discharge Elimination Systems
NPL	National Priority List
NPP	National Park and Preserve
NPR-A	National Petroleum Reserve – Alaska
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise-Sensitive Areas
NSB	North Slope Borough
NSPS	New Source Performance Standards
NTC	national training center
NTP	Notice to Proceed
NVIC	Navigation and Vessel Inspection Circular
NWA	Northwest Alaska Pipeline
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O_3	Ozone
OC	open-cut
OCS	Outer Continental Shelf
OD	outside diameter
OEP	FERC, Office of Energy Projects
OHA	ADNR Division of Parks and Outdoor Recreation, Office of History and Archaeology
ONA	Outstanding Natural Area
OPMP	ADNR, Office of Project Management and Permitting
OU	Operating unit
PAC	potentially affected community
Pb	the element lead
PBTL	Prudhoe Bay Gas Transmission Line
PBU	Prudhoe Bay Unit
PCB	polychlorinated biphenyl
PHMSA	Pipeline and Hazardous Materials Safety Administration
$PM_{2.5}$	particulate matter having an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter having an aerodynamic diameter of 10 microns or less
PMP	Point Thomson Gas Transmission Line milepost
POC	Plan of Cooperation
POD	Plan of Development
Project	Alaska LNG Project
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
PTTL	Point Thomson Gas Transmission Line
PTU	Point Thomson Unit

ABBREVIATION	DEFINITION
PWS	public water supply
Q&A	question and answer
RCA	Regulatory Commission of Alaska
RCRA	Resource Conservation and Recovery Act
RNA	Research Natural Area
ROD	Record of Decision
ROE	right-of-entry
ROW	right-of-way
RR	Resource Report
SCC	Deadhorse Airport
SDWA	Safe Drinking Water Act
SEIS	Supplemental Environmental Impact Statement
SGR	State Game Refuge
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SMA	Special Management Areas
SRMA	Special Recreation Management Areas
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure Plan
SPCO	State Pipeline Coordinator's Office
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SPMT	self-propelled module transporters
SRA	State Recreation Area
SRR	State Recreation River
STATSGO	State Soil Geographic
STATSGO2	State Soil Geographic2 – General Soils Map of Alaska & Soils Data (2011)
SWAPA	Southwest Alaska Pilots Association
SWPPP	Stormwater Pollution Prevention Plan
TAHC	total aliphatic hydrocarbons
TAPS	Trans-Alaska Pipeline System
TBD	To be determined
TCC	Tanana Chiefs Conference
The Applicants' Plan	Applicants' Upland Erosion Control, Revegetation, and Maintenance Plan
The Applicants' Procedures	Applicants' Wetland and Waterbody Construction, and Mitigation Procedures
TPAH	total polycyclic aromatic hydrocarbons
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act
TSD	tug support dock
TSS	total suspended solids
UCIDA	United Cook Inlet Drift Association
UIC	Underground Injection Control
U.S.	United States
U.S.C.	U.S. Code

ABBREVIATION	DEFINITION
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health and Human Services
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USDW	underground sources of drinking water
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VPSO	Village Public Safety Officer
VRM	Visual Resource Management Methodology
VSM	Vertical Support Members
WELTS	Well Log Tracking System
WRCC	Western Regional Climate Center
WSA	Waterway Suitability Assessment
WSR	Wild and Scenic Rivers

9.0 RESOURCE REPORT NO. 9 – AIR AND NOISE QUALITY

9.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LP (Applicants) plan to construct one integrated LNG Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunity for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and FERC regulations, 18 C.F.R. § 153.2(d) (2014), define "LNG terminal" to include "all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States." With respect to this Project, the "LNG terminal" includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 800-mile, large diameter gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; a gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and a gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.

These components are shown in Resource Report No. 1, Figure 1.1-1, and their current basis for design is described below.

The new Liquefaction Facility will be constructed on the eastern shore of Cook Inlet in the Nikiski area of the Kenai Peninsula. The Liquefaction Facility will include the structures, equipment, underlying access rights and all other associated systems for pre-processing (other than that performed by the GTP) and liquefaction of natural gas, as well as storage and loading of LNG, including terminal facilities (dock) and auxiliary marine vessels used to support marine terminal operations (excluding LNG carriers). The Liquefaction Facility will include three liquefaction trains combining to process up to approximately 20 million metric tons per annum (MMTPA) of LNG. Three 160,000 cubic meter (m^3) tanks will be constructed to store the LNG. The Liquefaction Facility will be capable of accommodating two LNG carriers. The size range of LNG carriers that the Liquefaction Facility will accommodate will be determined through further engineering study and consultation with the United States Coast Guard (USCG) as part of the Waterway Suitability Assessment (WSA) process.

In addition to the Liquefaction Facility, the LNG Terminal will include the following interdependent facilities:

- Mainline: A new large-diameter natural gas pipeline approximately 800 miles in length will extend from the Liquefaction Facility to the GTP on the North Slope, including the structures, equipment, and all other associated systems. The diameter of the pipeline has not been finalized but for the purpose of these Resource Reports a 42-inch diameter pipeline is assumed. The Mainline will include compressor stations, heater stations, meter stations, and various mainline block valves; pig launcher and receiver facilities; and associated ancillary and auxiliary facilities. Ancillary and auxiliary facilities will include additional temporary work spaces, access roads, helipads, construction camps, pipe storage areas, contractor yards, material extraction sites, and material disposal sites. Along the Mainline route, there will be at least five off-take interconnection points to allow for the opportunity for future in-state deliveries of natural gas. The size and location of such interconnection points are unknown at this time. None of the potential third-party facilities used to condition, if required, or move natural gas away from these off-take points will be part of the Project.

- GTP: A new GTP and associated facilities in the Prudhoe Bay area will receive natural gas from the PBU Gas Transmission Line and the PTU Gas Transmission Line. The GTP will treat/process the natural gas for delivery into the Mainline. The Project also includes a new pipeline that will deliver natural gas processing byproducts from the GTP to the PBU.

- PBU Gas Transmission Line: A new natural gas transmission line will extend approximately one mile from the inlet flange of the GTP to the outlet flange of the PBU gas production facility.

- PTU Gas Transmission Line: A new natural gas transmission line will extend approximately 60 miles from the inlet flange of the GTP to the outlet flange of the PTU gas production facility.

- Ancillary Facilities: Existing State of Alaska transportation infrastructure will be used during the construction of these new facilities including ports, airports, roads, and airstrips (potentially including previously abandoned airstrips). The potential need for new infrastructure and modifications or additions to these existing in-state facilities is under evaluation. The Liquefaction Facility, Mainline, and GTP will require the construction of material offloading facilities.

Draft Resource Report No. 1, Appendices A and B contain general maps of the Project footprint. Detailed plot plans will be developed during the pre-front-end engineering and design (Pre-FEED) process and will be provided to the Commission in a subsequent draft of Resource Report No. 1. An update to the current list of affected landowners is being filed under separate cover as privileged and confidential information.

Outside the scope of the Project, but in support of, or related to, the Project, additional facilities or expansion/modification of existing facilities will be needed or may be constructed. These other projects may include:

- Modifications/new facilities at the PTU;

- Modifications/new facilities at the PBU;

- Relocation of the Kenai Spur Highway; and
- Third-party pipelines and associated infrastructure to transport natural gas from the off-take interconnection points to markets in Alaska.

9.1.1 Purpose of Resource Report

As required by 18 C.F.R. § 380.12, the Project Applicants have prepared this draft Resource Report in support of a future application under Section 3 of the NGA to construct and operate the Project facilities. The purpose of this Resource Report is to:

- Describe the existing air quality and noise environment in the general vicinity of the Project;
- Summarize potential impacts to these resources resulting from construction and operation of the Project; and
- Identify appropriate mitigation measures to avoid or minimize potential adverse impacts to air quality and noise in the vicinity of the Project.

The data for this draft Resource Report were compiled based on a review of the following:

- Engineering design and proposed construction plans;
- Recent aerial photography;
- Field survey data;
- Scientific literature; and
- Data from federal and state agencies.

9.1.2 Agency and Organization Consultations

This section describes consultations that will be conducted with agencies and other interested parties related to the Project, as Project details are refined in the Pre-FEED process. A subsequent draft of this Resource Report will describe these additional consultations.

9.1.2.1 Federal Agencies

A list of the required federal permits for the Project is provided in Resource Report No. 1, Appendix C. A summary of public, agency, and stakeholder engagement conducted for the Project is provided in Resource Report No. 1, Appendix D. Subsequent versions of this Resource Report will provide air and noise specific correspondences with federal agencies.

9.1.2.2 State Agencies

A list of the required state permits for the Project is provided in Resource Report No. 1, Appendix C. A summary of public, agency, and stakeholder engagement is provided in Resource Report No. 1, Appendix

D. Subsequent versions of this Resource Report will provide air and noise specific correspondences with state agencies.

9.1.2.3 Other Interested Parties

Meetings and correspondence with local agencies and other interested parties will be presented in a subsequent draft of this Resource Report. A summary of public, agency, and stakeholder engagement is provided in Resource Report No. 1, Appendix D.

9.2 METEOROLOGY AND AIR QUALITY

This section describes the meteorological conditions and existing air quality in the vicinity of the Project, as well as potentially sensitive air quality receptors such as Class I areas. This section also includes a description of the applicable air quality regulations that require submittal and approval of site-specific permit applications for the proposed operations.

9.2.1 Regional Climate

Alaska's diverse climate is characterized by widely varying temperature ranges and weather phenomena due to the state's size, highly variable topographical features, and location within the high latitudes. The climate and meteorological conditions in localized areas of the Project will influence the design and operation of Project facilities. Meteorological conditions will also play an important role in determining (1) the direction of atmospheric transport and (2) the degree of dispersion of air pollutants emitted from emission sources associated with Project construction and operation.

9.2.1.1 Topographic Features and Elevation

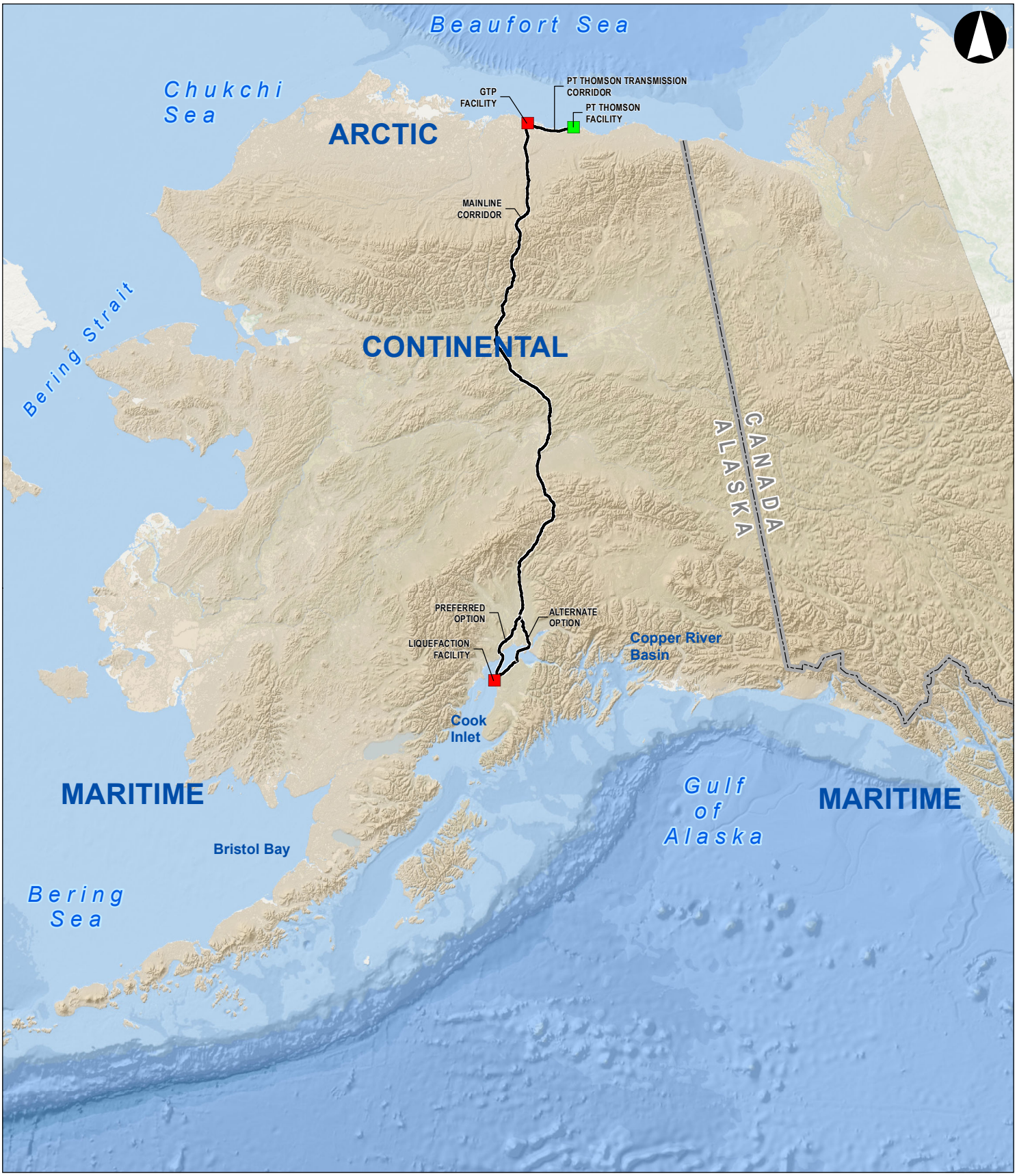
Climate conditions are dramatically affected by topography and elevation, especially in Alaska where the influences of the Arctic Ocean and the Pacific Ocean are demarcated by major mountain ranges. The Brooks Range extends across northern Alaska, and the Alaska Range extends across the southern third of Alaska eastward into Canada. These two mountain ranges delineate the major climatic zones (see Section 9.2.1.2) that affect the Project, with smaller transitional areas between each of the regions.

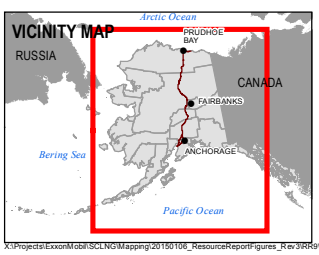
9.2.1.2 Climate and Regional Zones

Alaska's climate falls into three major climatic zones:

- Arctic Climate;
- Continental Climate; and
- Maritime Climate.

The number of discrete climatic zones has sometimes been expanded to include two smaller, transitional regions between Maritime and Continental zones, the first encompassing the western portions of Bristol Bay and west-central Alaska, and the second covering the southern portion of the Copper River Basin, Cook Inlet, and the northern extremes of the south coast. The climatic zones of Alaska relevant to this Project are depicted in Figure 9.2.1-1, and the applicable regions within these zones are as follows:





LEGEND

- Project Facility
- Existing Facility
- Project Corridor

0 60 120 240 Miles

DISCLAIMER

The information contained herein is for informational or planning purposes only, It does not nor should it be deemed to be an offer, request or proposals for rights or occupation of any kind. The Alaska LNG Project Participants and their respective officers, employees and agents, make no warranty, implied or otherwise, nor accept any liability, as to the accuracy or completeness of the information contained in these documents, drawings or electronic files. Do not remove or delete this note from document, drawing or electronic file.

PREPARED BY:	EXP ENERGY SERVICES INC.		
SCALE:	1:10,000,000		
DATE:	2015-01-09	SHEET:	1 of 1

CLIMATE ZONES AND TOPOGRAPHY OF ALASKA

FIGURE 9.2.1-1

Alaska LNG

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_2_1-1 Climate Zones and Topography of Alaska.mxd

- North Slope - The North Slope region, north of the Brooks Range, is dominated by an Arctic Climate, with elevations ranging from sea level to approximately 1,500 feet in the Brooks Range foothills.

- Brooks Range - The Brooks Range, with elevations reaching 4,800 feet at Atigun Pass, is not a separate climatic zone; however, local elevation and topography, especially at locations in narrow valleys, lead to unique climate features in this region.

- Interior of Alaska - The Interior of Alaska, between the Brooks Range and the Alaska Range, is dominated by a Continental Climate, with elevations ranging from a few hundred feet to approximately 1,000 feet.

- Alaska Range - The Alaska Range is not a separate climatic zone; however, local elevation and topography dominate the local climatic features. Elevations along the Project corridor range from approximately 1,000 feet in the foothills to 2,400 feet.

- Southcentral - The Southcentral portion of Alaska, south of the Alaska Range, including lands around the Cook Inlet, is dominated by a Maritime Climate, with a transitional zone in the southern foothills of the region. Elevations along the Project corridor range from approximately 1,000 feet in the Alaska Range foothills to sea level along Cook Inlet.

Liquefaction Facility

At the proposed location of the Liquefaction Facility on the Cook Inlet, a Maritime Climate prevails. The Maritime Climate is influenced by exposure to the Gulf of Alaska and is wetter and overall warmer than the climate for the rest of the Project area. Frequent precipitation, in the form of rain or snow, as well as clouds and milder temperatures, occurs during all seasons but particularly during the winter. As a result of the Project, LNG carriers will traverse Cook Inlet from the Marine Terminal to the head of Cook Inlet, approximately 140 miles south, before reaching the Gulf of Alaska.

Interdependent Facilities

In the North Slope region, the Project area is exposed to cold Arctic weather and associated wind flow patterns. The Arctic Climate is characterized by very cold winters, persistent high wind episodes (any season), and frequent fog conditions that are influenced by wind flow from the ice shield, especially in the warmer months.

In the Alaska Interior, there are very cold, stable air episodes in the winter with a warmer growing season in the summer. Occasional periods of high temperature, dry conditions, and stable atmospheric conditions occur in the summer.

The Mainline corridor will cross mountain ranges and a transition zone, which generally involves cold winter conditions, an abundance of precipitation (largely as snow), and rapidly changing weather. Local climatic conditions are heavily influenced by local topographic features in these mountainous regions.

In Southcentral Alaska, the southernmost portion of the Mainline corridor, a Maritime Climate similar to the one described for the Liquefaction Facility, prevails.

In subsequent sections of this Resource Report, climatological and air quality data are provided for the Project area, including data from some stations which are representative of the Brooks and Alaska Ranges.

9.2.1.3 Meteorological Stations

A number of weather stations are maintained in the Project vicinity[2] and provide data useful for characterizing weather conditions that will exist during Project construction and operation. Table 9.2.1-1 lists the stations that have been identified in the Project vicinity and Figure 9.2.1-2 depicts their location. Information from these stations has been obtained from several climate agencies, including the National Climatic Data Center (NCDC), the Alaska Climate Research Center (ACRC), and the Western Regional Climate Center (WRCC). Climate statistics from a number of the stations within the general Project vicinity are presented in Table 9.2.1-2.

TABLE 9.2.1-1

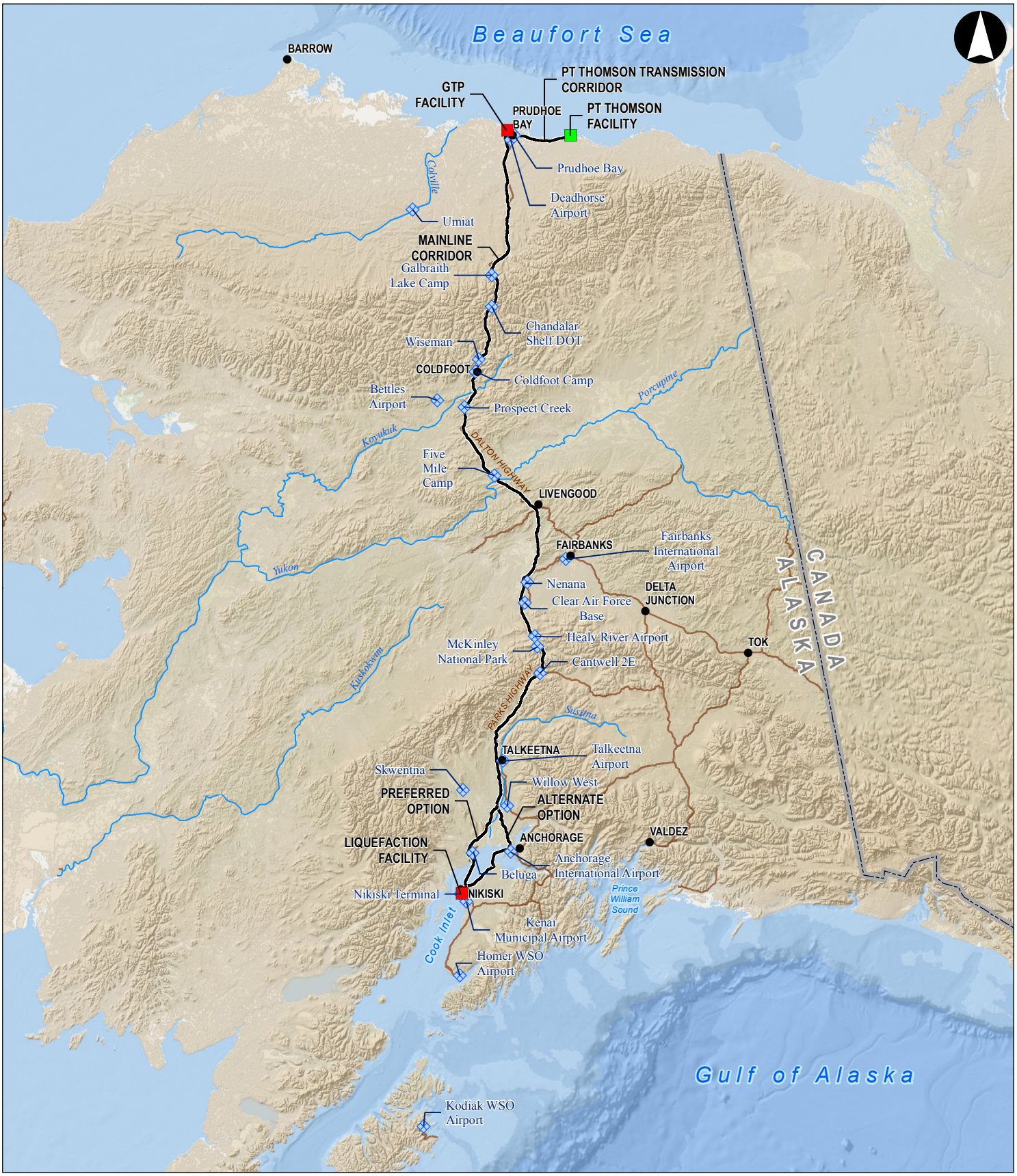
Description of Meteorological Measurement Stations within the Project Vicinity

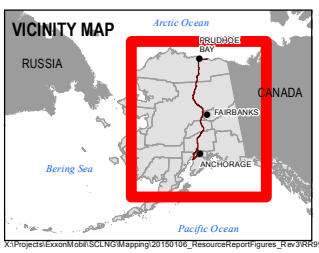
Station Name	Station Type	Years Active	North Latitude	West Longitude	Elevation (feet)	Information Source
LIQUEFACTION FACILITY						
Nikiski Terminal	COOP	1967-1979	60.66667	-151.38333	110	NCDC
Kenai FAA Airport	Airways, ASOS, COOP	1939-Present	60.56667	-151.25	91	NCDC
INTERDEPENDENT FACILITIES						
NORTH SLOPE						
Prudhoe Bay	COOP	1986-1999	70.25	-148.3333	50	WRCC
Deadhorse	Airways, ASOS, COOP	1969-Present	70.1917	-148.4772	61	ACRC/NCDC
Umiat	COOP	1946-2008	69.36944	-152.14	266	NCDC
BROOKS RANGE						
Galbraith Lake	COOP	1970-1980	68.47889	-149.49	2,666	WRCC
Chandalar ADOTPF	COOP	2000-Present	68.0781	-1495647	3,250	NCDC
Wiseman	COOP	1949-2012	67.4192	-150.1069	1,147	WRCC
Coldfoot Camp	COOP	1970-1977	67.2667	-150.2333	1,102	WRCC
INTERIOR						
Bettles FAA Airport	Airways, ASOS, COOP	1951-Present	66.92	-151.52	643	ACRC/NCDC
Prospect Creek Camp	Airways, COOP	1974-2010	66.82361	-150.66889	955	NCDC
Five Mile Camp	COOP	1974-1980	65.9333	-149.8333	440	WRCC
Fairbanks WSO Airport	ASOS, COOP	1929-Present	64.8039	-147.8761	432	ACRC/NCDC
Nenana Municipal Airport	ASOS	1930-Present	64.55	-149.07167	360	NCDC

[2] The terms "Project area" and "Project footprint" are defined to include the Project facilities and land requirements for construction and operation. The term "Project vicinity" is used to mean the area or region near or surrounding the Project area and draws it's meaning from the context in which the term is used.

Clear 4N	COOP	1959-1998	64.3	-149.18333	580	NCDC
ALASKA RANGE						
Healy 2NW	Airways, AWOS	2005-Present	63.86611	-148.96889	1,294	NCDC
McKinley Park	AWOS	1949-Present	63.73333	-148.91667	1,720	NCDC
Cantwell 2E	COOP	1983-2011	63.3952	-148.895	2,132	NCDC
SOUTHCENTRAL						
Talkeetna WSCMO Airport	ASOS, COOP	1940-Present	62.32	-150.095	350	NCDC
Willow West	COOP	1977-2011	61.748	-150.0541	205	NCDC
Skwentna	COOP	1939-Present	61.9772	-151.2169	150	NCDC
Anchorage WB Airport	Airways, ASOS, COOP	1952-Present	61.169	-150.0278	120	NCDC
Beluga	COOP	1973-1992	61.18333	-151.03333	79	NCDC
Homer WSO Airport	ASOS, COOP	1939-Present	59.642	-151.4908	64	NCDC
Kodiak WSO Airport	ASOS, COOP	1941-Present	57.75111	-152.48556	72	NCDC

Source: NCDC, 2011
Abbreviations
Airways: Airport
ASOS – Automated Surface Observation System
COOP – National Weather Service Cooperative Observer Program
AWOS – Automated Weather Observing System
NCDC - National Climatic Data Center
WRCC - Western Regional Climate Center
ACRC - Alaska Climate Research Center





X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_2_1-2 Meteorological Stations within the Project Vicinity.mxd

LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Meteorological Station
- Project Corridor
- Major Highways
- Major Rivers

0 40 80 160 Miles

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DATE:	2015-01-09	SHEET:	1 of 1

METEOROLOGICAL STATIONS WITHIN THE PROJECT VICINITY

FIGURE 9.2.1-2

Alaska LNG

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
LIQUEFACTION FACILITY													
Nikiski Terminal 1967-1978													
Average Max. Temperature (°F)	20.6	28.7	31.7	40.3	51	57.4	61.7	61.5	55.4	42.7	31	24	42.2
Average Min. Temperature (°F)	4.8	10.7	13.4	25.2	36	43.9	48.9	48.6	41.2	30.3	17.3	10.2	27.5
Average Total Precipitation (in.)	0.61	1.07	0.68	0.97	0.99	1.1	1.26	2.59	3.13	2.48	1.86	1.14	17.89
Average Total Snowfall (in.)	1.9	6.8	4.5	4.1	0	0	0	0	0	1.9	4.5	9.4	33
Average Snow Depth (in.)	11	14	6	6	1	0	0	0	0	0	2	8	4
Kenai FAA Airport 1949-2012													
Average Max. Temperature (°F)	20.9	26.8	32.6	42.8	53.1	58.8	62.1	61.9	55.3	42.2	29.5	22.7	42.4
Average Min. Temperature (°F)	4	8.2	12.9	26.3	35.4	42.9	47.5	45.9	39	27.7	14.1	7.2	25.9
Average Total Precipitation (in.)	0.99	0.96	0.8	0.74	0.89	1.21	1.89	2.61	3.33	2.44	1.5	1.34	18.71
Average Total Snowfall (in.)	9.5	10.3	8.6	3.5	0.3	0	0	0	0.1	4.8	10.3	13.8	61.2
Average Snow Depth (in.)	12	13	12	3	0	0	0	0	0	1	3	8	4
INTERDEPENDENT FACILITIES													
NORTH SLOPE													
Prudhoe Bay 1986-1999													
Average Max. Temperature (°F)	-11.9	-10.1	-5.2	10.1	28.8	45.2	55.4	51	38.3	21	0.9	-6.6	18.1
Average Min. Temperature (°F)	-24	-24.3	-20.3	-4.8	19	32.7	39.7	37.5	28.9	9.7	-11	-19.2	5.3
Average Total Precipitation (in.)	0.2	0.17	0.14	0.08	0.09	0.39	0.68	1.14	0.61	0.38	0.18	0.2	4.26
Average Total Snowfall (in.)	2.8	2.4	2.7	1.7	1.4	1	0	0.5	3.5	9.3	4.3	3.5	33.1
Average Snow Depth (in.)	4	4	4	3	1	0	0	0	0	3	3	4	2
Deadhorse 1999-2010													
Average Max. Temperature (°F)	-8.9	-9.2	-11	9.6	26.1	46	53.6	49.1	40	22.8	6.7	-0.7	18.7
Average Min. Temperature (°F)	-22	-22	-24	-5.4	16.1	33	38.6	36.5	30	12.6	-6.2	-13.9	6.1
Average Total Precipitation (in.)	0.07	0.04	0.01	0.15	0.21	0.5	0.96	0.94	0.4	0.21	0.07	0.11	3.64
Average Total Snowfall (in.)							No Data						
Average Snow Depth (in.)							No Data						
Umiat 1949-2001													
Average Max. Temperature (°F)	-12.7	-13.8	-6.7	11.5	32.4	57.5	66.2	57.7	41.4	18.2	-0.7	-11.9	19.9
Average Min. Temperature (°F)	-28.9	-31.2	-26.8	-11	15.7	37	42.5	37.2	26.1	2.4	-16.8	-28	1.5
Average Total Precipitation (in.)	0.38	0.26	0.16	0.21	0.07	0.68	0.79	1.06	0.47	0.68	0.38	0.33	5.46
Average Total Snowfall (in.)	4.5	2.4	2.3	1.9	1.2	0.2	0	0.2	2.6	8.5	5.2	4.2	33.2

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Snow Depth (in.)	14	16	17	17	9	0	0	0	0	5	9	12	8
BROOKS RANGE													
Galbraith Lake 1970-1980													
Average Max. Temperature (°F)	1.9	-3.7	2.9	18.7	41.6	55.7	61.2	59.2	40.1	15.6	10.4	-5.1	24.9
Average Min. Temperature (°F)	-18.4	-25.1	-21.3	-5.8	19.2	35.9	40.1	36.7	19.6	-3.1	-11.2	-24	3.5
Average Total Precipitation (in.)	0.68	0.26	0.39	0.12	0.36	1.42	0.93	1.6	0.7	1	0.5	0.51	8.46
Average Total Snowfall (in.)	8.5	2.9	6.8	1.4	0	0.7	0.5	0	4.6	9.2	6.6	5	46.1
Average Snow Depth (in.)	7	7	8	4	1	0	0	0	0	4	5	5	3
Chandalar ADOTPF 2000-2010													
Average Max. Temperature (°F)	1.4	4.3	5.9	23.7	41.3	57	57.2	52.6	39	20.2	8	6.5	26.4
Average Min. Temperature (°F)	-11	-8.6	-9.6	5.6	25	40	42	36.9	25	8.5	-3.4	-5.9	12
Average Total Precipitation (in.)	0.73	0.87	0.34	0.7	0.92	1.5	2.27	1.86	1.3	1.05	0.81	0.66	13.01
Average Total Snowfall (in.)	14	17.4	7.3	16.5	7.5	0.6	0	0	3.8	16.5	16.7	14.6	115
Average Snow Depth (in.)	23	32	36	41	23	0	0	0	0	7	15	21	16
Wiseman 1949-2010													
Average Max. Temperature (°F)	-2.7	5.5	17.3	36.8	54.5	69.4	69.1	62.1	49.5	26.3	8.7	2.8	33.3
Average Min. Temperature (°F)	-21.3	-15.3	-12.1	9.7	29.2	43.4	45.4	39.2	29.9	9.5	-7.7	-15.2	11.2
Average Total Precipitation (in.)	0.75	0.71	0.27	0.57	1	1.84	2.43	2.36	1.87	0.71	0.8	0.74	14.05
Average Total Snowfall (in.)	15	11.2	4.3	5.1	0.7	0	0	0	3	9.7	11.9	11.8	72.8
Average Snow Depth (in.)	20	25	24	18	3	0	0	0	0	3	9	15	10
Coldfoot Camp 1970-1977													
Average Max. Temperature (°F)	-10.1	-0.4	11.4	32	52.8	66	69.5	63.7	47.4	23.6	4.9	-1.5	29.9
Average Min. Temperature (°F)	-27.7	-22.9	-14.9	5.6	31.9	43	45.1	40.6	28.8	7.4	-11.2	-19.1	8.9
Average Total Precipitation (in.)	0.37	0.44	0.43	0.31	0.96	1.91	2.66	2.03	2.79	1.5	1.05	0.9	15.34
Average Total Snowfall (in.)	17.4	11.5	11.4	6.7	0.8	0	0	0	5	23.4	16.2	20.7	113.1
Average Snow Depth (in.)	15	31	23	21	3	0	0	0	0	7	11	17	11
INTERIOR													
Bettles FAA Airport 1951-2010													
Average Max. Temperature (°F)	-4.6	2	14.6	32.9	53.5	68.3	69.3	62.5	48.9	25.7	6	-1.3	31.5
Average Min. Temperature (°F)	-20.5	-16.7	-9.3	10.4	33.6	47	48.9	43.4	32.4	12.6	-8.1	-16.5	13.1
Average Total Precipitation (in.)	0.78	0.79	0.62	0.59	0.7	1.41	2.05	2.5	1.83	1.13	0.92	0.91	14.23
Average Total Snowfall (in.)	11.5	11.7	9.4	6.8	1	0	0	0	2	11.8	13.9	15.5	83.7

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Snow Depth (in.)	25	29	31	26	4	0	0	0	0	4	12	20	12
Prospect Creek Camp 1970-2001													
Average Max. Temperature (°F)	-6.8	1.1	15.5	33.5	55.0	64.4	69.7	65.1	50.2	25.6	7.5	-3.9	31.4
Average Min. Temperature (°F)	-22.9	-23.5	-10.7	6.4	30.8	42.0	46.0	40.1	28.5	7.4	-10.0	-21.2	9.4
Average Total Precipitation (in.)	0.38	0.48	0.37	0.20	0.69	2.34	1.76	1.98	2.34	1.14	0.94	0.57	13.20
Average Total Snowfall (in.)	8.7	8.0	8.7	4.7	0.1	0.0	0.0	0.0	2.1	15.0	15.7	14.1	77.3
Average Snow Depth (in.)	22	24	24	23	2	0	0	0	0	4	13	19	11
Five Mile Camp 1970-1980													
Average Max. Temperature (°F)	-10.8	-2	17.2	36.2	58.9	69.9	74.4	70	51	26.2	6.7	-11.1	32.2
Average Min. Temperature (°F)	-26.7	-25.1	-11.4	8.4	32	42.7	44.5	39.1	28.1	9.4	-12.7	-27.5	8.4
Average Total Precipitation (in.)	0.28	0.22	0.35	0.21	0.67	1.44	1.25	1.08	0.9	1.01	0.87	0.65	8.93
Average Total Snowfall (in.)	4.5	2.5	5.5	2.1	0.1	0	0	0	0.1	10.5	7.9	6.8	40
Average Snow Depth (in.)	18	19	19	13	0	0	0	0	0	2	8	9	7
Fairbanks WSO Airport 1949-2010													
Average Max. Temperature (°F)	-1.4	8.5	23.7	42.8	60.1	70.8	72.3	66.3	54.7	32.3	11.4	1.7	36.9
Average Min. Temperature (°F)	-19	-13.9	-3.4	20.4	37.9	49.3	52	46.8	35.7	17.4	-5	-15.2	16.9
Average Total Precipitation (in.)	0.57	0.44	0.35	0.28	0.58	1.34	1.96	1.84	1.05	0.77	0.67	0.69	10.53
Average Total Snowfall (in.)	10.4	8.6	6	3	0.7	0	0	0	1.3	10.3	12.6	12.2	65.2
Average Snow Depth (in.)	17	20	20	10	0	0	0	0	0	2	8	13	7
Nenana Municipal Airport 1949-2001													
Average Max. Temperature (°F)	-0.4	7.3	21.5	39.4	58	70.1	70.9	65.1	52.9	30.5	10.8	1.5	35.6
Average Min. Temperature (°F)	-19	-14.9	-5.7	16	33.9	44.8	47.7	43.4	33.1	14.9	-5.8	-16.6	14.3
Average Total Precipitation (in.)	0.54	0.46	0.31	0.19	0.51	1.37	2.17	2.22	1.14	0.67	0.65	0.54	10.76
Average Total Snowfall (in.)	7.7	6.1	4.2	2.2	0.2	0	0	0	0.8	6.7	9.3	7.8	45
Average Snow Depth (in.)	19	23	22	11	0	0	0	0	0	2	7	14	8
Clear 4N 1965-1997													
Average Max. Temperature (°F)	-4	4.9	21.7	39	57.6	69.9	70.6	66.1	52.7	28.7	11.3	5.7	35.3
Average Min. Temperature (°F)	-24.2	-16.3	-3.4	17.5	36.5	48.1	50.5	45.3	32	12.4	-8.4	-14.8	14.6
Average Total Precipitation (in.)	0.53	0.47	0.41	0.19	0.66	1.79	2.64	2.52	1.17	0.98	0.89	0.72	12.96
Average Total Snowfall (in.)	7.4	5.9	4.7	1.9	0.2	0	0	0	0.6	8.7	12.1	8.5	50.1
Average Snow Depth (in.)	15	15	11	5	0	0	0	0	0	2	8	12	6

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ALASKA RANGE													
Healy 2NW 1976-2012													
Average Max. Temperature (°F)	11.9	19.2	26.3	41.8	57	67.9	69.3	63.8	52.4	34	18	13.7	39.6
Average Min. Temperature (°F)	-5.9	-1	3.6	21.1	35.9	45.3	49.7	45.8	34.9	18.7	1.5	-5.7	20.3
Average Total Precipitation (in.)	0.55	0.58	0.35	0.53	0.91	2.39	2.74	2.46	1.57	1.12	0.71	0.84	14.75
Average Total Snowfall (in.)	10.2	8.5	7.4	4.1	1	0	0	0	3	14.7	14	13.9	76.7
Average Snow Depth (in.)	11	11	10	5	0	0	0	0	0	4	7	9	5
McKinley Park 1949-2012													
Average Max. Temperature (°F)	9.2	16.3	24.8	38.8	53.6	64.2	66.3	61.4	50.7	32.4	17.3	11.2	37.2
Average Min. Temperature (°F)	-7.8	-4.1	0.4	15.8	29.9	39.7	43.4	39.9	30.6	14.5	0.9	-5.6	16.5
Average Total Precipitation (in.)	0.68	0.6	0.46	0.37	0.8	2.32	3.14	2.57	1.54	0.92	0.83	0.9	15.12
Average Total Snowfall (in.)	10.3	10.2	7.7	5.1	2.9	0.3	0	0	4.2	12.3	13.1	13.4	79.5
Average Snow Depth (in.)	17	20	21	17	2	0	0	0	1	3	8	13	8
Cantwell 2E 1983-2011													
Average Max. Temperature (°F)	10.8	17.4	25.6	38.5	52.9	64.8	66	60.5	49.7	32.2	17.1	14	37.5
Average Min. Temperature (°F)	-8.8	-5.6	-1.5	14.6	28.8	38.3	44.2	40.3	30.9	14.3	-0.6	-5.4	15.8
Average Total Precipitation (in.)	0.96	0.76	0.46	0.43	0.76	1.68	2.66	3.2	2.6	1.21	1.09	0.93	16.75
Average Total Snowfall (in.)	22.3	15.8	12.3	10.8	5	0.2	0.2	0	4	16.2	17.5	19.8	123.9
Average Snow Depth (in.)	24	28	29	20	3	0	0	0	0	3	9	15	11
SOUTHCENTRAL													
Talkeetna WSCMO Airport 1949-2012													
Average Max. Temperature (°F)	19.6	26.1	33.6	44.8	57	65.6	67.8	64.6	55.5	40	26.1	20.4	43.4
Average Min. Temperature (°F)	1.9	5.9	9.9	23.6	34.8	45.4	49.6	46.4	37.4	24.2	9.9	3.6	24.4
Average Total Precipitation (in.)	1.38	1.45	1.22	1.34	1.47	2.19	3.37	4.77	4.21	2.69	1.74	1.75	27.56
Average Total Snowfall (in.)	18.6	20	17.1	9.2	0.9	0	0	0	1.2	11.6	19.2	22.8	120.6
Average Snow Depth (in.)	27	30	31	18	2	0	0	0	0	2	8	17	11
Willow West 1960-2011													
Average Max. Temperature (°F)	9.1	23	33.9	45.8	56.3	66.2	68.9	64.8	56.5	40.4	23.5	15.5	42
Average Min. Temperature (°F)	-7.8	2.6	7.2	23.7	33.7	45.4	49.8	46	36.4	21.3	6.5	-1.5	22
Average Total Precipitation (in.)	1.51	1.9	1.05	0.89	1.14	1.53	2.12	3.73	3.41	2.46	1.69	2.05	23.5
Average Total Snowfall (in.)	13.9	13.7	7.4	2.2	0.2	0	0	0	0	7.3	14.9	19.9	79.3
Average Snow Depth (in.)	24	27	26	12	0	0	0	0	0	1	8	15	9

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Skwentna 1949-2012													
Average Max. Temperature (°F)	16.2	23.5	34.1	45	57.6	67	69.6	65.8	55.8	40	24.4	17.4	43
Average Min. Temperature (°F)	-2.1	1.6	9.1	23.4	33.4	43.3	47.3	44.9	36.1	24.1	9.3	0.6	22.6
Average Total Precipitation (in.)	2.18	1.87	1.11	1	1.1	1.41	2.33	3.44	3.89	3.3	2.3	2.82	26.73
Average Total Snowfall (in.)	22.3	19.6	11.6	6.4	0.1	0	0	0	0.5	11	19.6	28.6	119.8
Average Snow Depth (in.)	32	38	38	26	2	0	0	0	0	2	10	22	14
Anchorage WB Airport 1931-2012													
Average Max. Temperature (°F)	20.2	27.3	33.3	45.1	55.1	63	65.9	63.8	56.1	42.8	28.3	20.8	43.5
Average Min. Temperature (°F)	5.1	11	14.3	27.5	36.9	45.3	49.4	47.5	39.7	29.3	15.5	8.1	27.5
Average Total Precipitation (in.)	0.78	0.59	0.52	0.38	0.53	1.03	1.57	2.63	2.62	1.97	1.05	0.97	14.53
Average Total Snowfall (in.)	11.3	7.5	7.3	2.8	0.6	0	0	0	0	5.2	9.9	12	56.6
Average Snow Depth (in.)	10	10	7	1	0	0	0	0	0	0	2	6	3
Beluga 1973-1992													
Average Max. Temperature (°F)	25.8	28.4	36.6	44.4	56.2	64.1	67	64.6	56.6	42.6	29.7	24.3	45
Average Min. Temperature (°F)	10.6	8.8	16.4	25.2	35.9	43.1	47.9	46.3	39.7	27.9	13.6	9	27
Average Total Precipitation (in.)	1.64	1.24	1.27	0.93	1.05	1.46	2.21	3.49	5.4	4.01	1.97	2.38	27.05
Average Total Snowfall (in.)	11.6	9.7	11.7	3	0	0	0	0	0	6	13.7	23.4	79
Average Snow Depth (in.)	24	26	27	17	1	0	0	0	0	1	7	17	10
Homer WSO Airport 1932-2012													
Average Max. Temperature (°F)	29.1	32.3	35.5	43.1	50.7	57.1	60.8	60.5	54.9	44.5	35	30.1	44.5
Average Min. Temperature (°F)	16.5	18.9	21.3	28.9	35.7	42.1	46.3	46	40.3	31.3	22.8	18.1	30.7
Average Total Precipitation (in.)	2.22	1.81	1.52	1.2	0.97	0.96	1.56	2.46	3.06	3.13	2.74	2.83	24.47
Average Total Snowfall (in.)	9.6	11.3	9.2	2.9	0.3	0	0	0	0	2.1	7.4	12.1	54.9
Average Snow Depth (in.)	4	5	5	2	0	0	0	0	0	0	1	4	2
Kodiak WSO Airport 1973-2012													
Average Max. Temperature (°F)	35.4	36	38.3	43.6	50	55.6	60.1	61.7	56.1	47.2	39.6	36.4	46.7
Average Min. Temperature (°F)	26.1	25.7	27.5	32.5	38.6	44.4	49	49	43.5	34.8	28.7	25.9	35.5
Average Total Precipitation (in.)	8.53	6.07	5.15	5.5	6.1	5.35	4.61	4.72	7.67	8.49	6.66	8.18	77.04
Average Total Snowfall (in.)	15.8	16	13.1	7.2	0.4	0	0	0	0	1.3	7.5	14.8	76.1
Average Snow Depth (in.)	2	2	1	0	0	0	0	0	0	0	0	1	1

Source: WRCC, 2011
Abbreviations:
°F – degrees Fahrenheit
ADOTPF – Alaska Department of Transportation and Public Facilities

TABLE 9.2.1-2

Available Regional Climate Summaries for Stations within the Project Vicinity

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual

FAA – U.S. Federal Aviation Administration
in. – inches

9.2.1.4 Summary of Meteorological Conditions

A summary of the meteorological conditions within the Project area based on the information listed in Table 9.2.1-2 is provided below.

Temperature

Based on available data, the coldest locations in the Project area are (1) on the North Slope at Prudhoe Bay and Deadhorse and (2) on the north side of the Brooks Range near Galbraith Lake. Extreme cold persists in the winter months over the North Slope, with daily average temperatures below 0 °F over the months of December through March. In July and August, average daily high temperatures are above 50 °F, with average daily lows above freezing.

The Interior of Alaska exhibits the largest seasonal range in temperatures as well as the largest daily range of temperatures. Extremely cold weather can persist during the winter months, with occasional two- or three-week periods of temperatures below -40 °F. The coldest temperature recorded in the Project vicinity was in the -80 ºF range at Prospect Creek on January 23, 1971. In the summer months, average high temperatures are above 70 °F, with occasional days above 90 °F. The warmest location in the Project vicinity is around Fairbanks. The warmest summer temperature recorded in the Project vicinity was at Fairbanks, which reached 96 ºF on June 15, 1969.

In the Southcentral region, temperature ranges are more moderate, with average summer temperatures in the 60 °F range and winter temperatures in the 20 °F range. In the transition zone, temperatures are slightly cooler but still exhibit a comparatively moderate annual and daily temperature range.

Precipitation

Precipitation on the North Slope is generally low, with an average of less than 10 inches per year. The Brooks Range and areas just south have a relatively high amount of snowfall (70 inches or more annually). The maximum annual snowfall recorded in the Project area was at Prospect Creek with over 163 inches of snow in 1971.

As a location representative of the Interior of Alaska, Fairbanks receives 65 inches of snow per year on average. Total annual precipitation generally averages above 10 inches per year, with the bulk of that amount occurring as rainfall during the summer months.

Precipitation in the Southcentral region is both heavier and more frequent than in the other areas, generally occurring throughout the year. Some areas in the Alaska Range have precipitation averages above 60 inches per year. Relatively heavy precipitation can also occur with the passage of large mid-latitude cyclone systems. Snowfall often occurs in the region from October through April.

Relative Humidity

Humidity and dew point data are not available for many Alaska meteorological stations; however, the NCDC has reported average humidity for some areas. The annual average relative humidity at Fairbanks and Bettles are both around 60 percent.

Wind

The more exposed North Slope locations experience much stronger wind speeds than the rest of the Project area. Except for localized strong wind conditions from passing storms, winds are generally light in Interior Alaska, especially at lower elevations.

Wind speed data (speed and direction) are sparse at most of the stations within the Project vicinity; however, wind speed has been recorded at Fairbanks and Bettles. In Fairbanks, the highest wind speeds occur during the summer with an annual mean wind speed of 5.4 miles per hour (mph). The prevailing wind direction recorded at the Fairbanks Airport is from the north. Blizzard conditions are almost never seen, as winds in Fairbanks are above 20 mph less than one percent of the time. The Bettles station seldom sees strong winds during any season of the year or any significant directional variation from a prevailing northerly wind (WRCC, 2011). In the Southcentral region, stronger winds generally occur with passing mid-latitude storms and higher than average winds are found along exposed ridges and coastlines.

Local wind flow patterns tend to be channeled or diverted by topographical features, such as mountain passes, valleys, and waterbodies. Thus, due to the complex terrain found in the Brooks and Alaska Ranges, wind speeds and directions are expected to be highly localized due to long-valley channeling and cross-valley slope flow.

Fog, Clouds, and Visibility

Fog forms when the dew point temperature (where water vapor becomes visible) equals the ambient temperature. Except on the North Slope, fog rarely forms in the summer in Alaska because the ambient temperature is significantly higher than the dew point temperature, even near waterbodies. Spring and fall are the times of the year when fog is more likely to form, especially in areas near large waterbodies that have higher dew point temperatures. Fog is almost always less than 300 feet thick, so the surrounding uplands are usually clear, with warmer temperatures. Visibility in the ice fog is sometimes quite low, and this can hinder aircraft operations for as much as a day in severe cases (WRCC, 2011).

Interior Alaska winter temperatures can reach low enough levels (-20 °F to -60 °F) to create ice fog on a fairly frequent basis. As cold air is denser, cold high-pressure systems are formed, which are very difficult to displace. Thus, stable conditions with no wind can persist for several days and weeks causing long-lasting ice fogs in Interior locations (NCDC, 2011). Cold snaps in Fairbanks accompanied by winter ice fog generally last about a week, but these conditions can last up to three weeks in unusual situations.

Cloud cover and storm observations are also limited in the Project vicinity. In Fairbanks and Bettles, cloudy days occur for approximately 200 days of the year, while 90 days per year are partly cloudy, and approximately 70 days are clear (NCDC, 2011).

9.2.1.5 Limitations of the Station Network and Parameters to Support Air Dispersion Modeling

While climate summaries within the Project vicinity may be obtained from a variety of different climate agencies, many of the monitoring programs do not provide complete sequential, hourly data collected over a long enough period to support air dispersion modeling for regulatory applications. The dispersion modeling that will be performed as part of the air quality permitting process for the Project will require at least one year of valid hourly data. The modeling will also require good data capture for a number of specific parameters, including temperature, wind speed, wind direction (vertical and horizontal), cloud cover and ceiling height, solar radiation, and vertical temperature difference.

Surface meteorological data of sufficient quantity and quality to support air dispersion modeling are presently available only on the North Slope, in the Fairbanks and Anchorage areas, and on the Kenai Peninsula. In order to ensure that adequate meteorological data will be available to support permitting, the Project will work with the Alaska Department of Environmental Conservation (ADEC) to determine whether meteorological data representative of locations for the proposed stationary sources (i.e., Liquefaction Facility, GTP, compressor stations, heater stations) are publicly available, either from major airport weather stations (e.g., Deadhorse, Fairbanks, and Anchorage) or from private monitoring conducted as part of regulatory monitoring projects (e.g., Prudhoe Bay and various locations along the Trans-Alaska Pipeline). ADEC will be consulted to identify appropriate locations and instrumentation for additional monitoring stations if these are required to address gaps in available data.

9.2.2 Existing Ambient Air Quality

Federal and state air emissions regulations are designed to ensure that new sources do not cause or contribute to an exceedance of ambient standards for criteria air pollutants. The criteria pollutants are as follows:

- Sulfur dioxide (SO_2);
- Carbon monoxide (CO);
- Nitrogen dioxide (NO_2);
- Ozone (O_3);
- Particulate matter having an aerodynamic diameter of 10 microns or less (PM_{10});
- Particulate matter having an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$); and
- Lead (Pb).

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for these seven pollutants. The NAAQS are set at levels the EPA believes are necessary to protect public health (primary standards) and welfare (secondary standards).

The ADEC has established similar ambient air quality standards referred to as Alaska Ambient Air Quality Standards (AAAQS). AAAQS are similar to the federal NAAQS for criteria pollutants, except

that ADEC has yet to remove the 24-hour and annual standard for SO_2. ADEC also has an 8-hour AAAQS for ammonia and a 30-minute standard for (total) reduced sulfur compounds. Table 9.2.2-1 lists both the federal and state ambient air quality standards. The ambient air quality data presented in this section for specific locations are based on maximum observed values for each pollutant and averaging period, except where noted. The ambient standards express units as concentrations relative to a specified time duration, which does not translate to maximum observed values.

TABLE 9.2.2-1

Ambient Air Quality Standards in the Project Vicinity

Air Pollutant	Averaging Period	NAAQS	AAAQS
Sulfur Dioxide	1-Hour[a]	75 ppbv	196 µg/m^3
	3-Hour[b]	0.5 ppmv	1,300 µg/m^3
	24-Hour[b]	---	365 µg/m^3
	Annual	---	80 µg/m^3
Carbon Monoxide	1-Hour[b]	35 ppmv	40 mg/m^3
	8-Hour[b]	9 ppmv	10 mg/m^3
Nitrogen Dioxide	1-Hour[c]	100 ppbv	188 µg/m^3
	Annual	53 ppbv	100 µg/m^3
Ozone	8-Hour[d]	0.075 ppmv	0.075 ppmv
Particulate Matter less than 10 Microns	24-Hour[b]	150 µg/m^3	150 µg/m^3
Particulate Matter less than 2.5 Microns	24-Hour[c] Annual	35 µg/m^3 12 µg/m^3	35 µg/m^3 15 µg/m^3
Lead	Rolling 3-Month Average	0.12 µg/m^3	0.15 µg/m^3
Ammonia	8-Hour[b]	----	2.1 mg/m^3
Reduced Sulfur Compounds	30-Minute[e]	----	50 µg/m^3

Sources: EPA 2011a; ADEC 2014a

Abbreviations:

--- = Not applicable

µg/m^3 = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

ppbv = parts per billion by volume

ppmv = parts per million by volume

Notes:

[a] Standard is attained when the 3-year average of the 99th percentile of the distribution of daily maximum values is less than 75 ppb, or 196 µg/m^3.

[b] Second-highest average concentration not to be exceeded more than once in a year.

[c] Standard is attained when the 3-year average of the 98th percentile of the distribution of daily maximum values is less than the standard.

[d] Three-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration.

[e] Standard is referenced to sulfur dioxide and is not to be exceeded more than once per year.

The federal Clean Air Act (CAA) requires geographic areas that do not meet a particular NAAQS to be designated as "non-attainment" for that individual standard. Other areas can be designated as "in attainment" if data show that the area meets the standard, as "unclassified," or as "unclassified/attainment" with respect to the standards. An area may also be designated as a "maintenance" area if it has previously been in non-attainment for a pollutant but has since implemented a State Implementation Plan (SIP) that has brought the area back into attainment for the pollutant.

Alaska has one non-attainment area and four maintenance areas (ADEC 2014a, EPA 2014b, and 40 C.F.R 81.302). The Fairbanks and North Pole urban area is designated as non-attainment for $PM_{2.5}$. The Mendenhall Valley in the City and Borough of Juneau and the Eagle River area in the Municipality of Anchorage are designated as maintenance areas for PM_{10}. The Municipality of Anchorage and the Fairbanks and North Pole urban area are designated as maintenance areas for CO. ADEC's SIP describes how the State of Alaska will comply with the CAA and achieve attainment with the NAAQS and/or AAAQS.

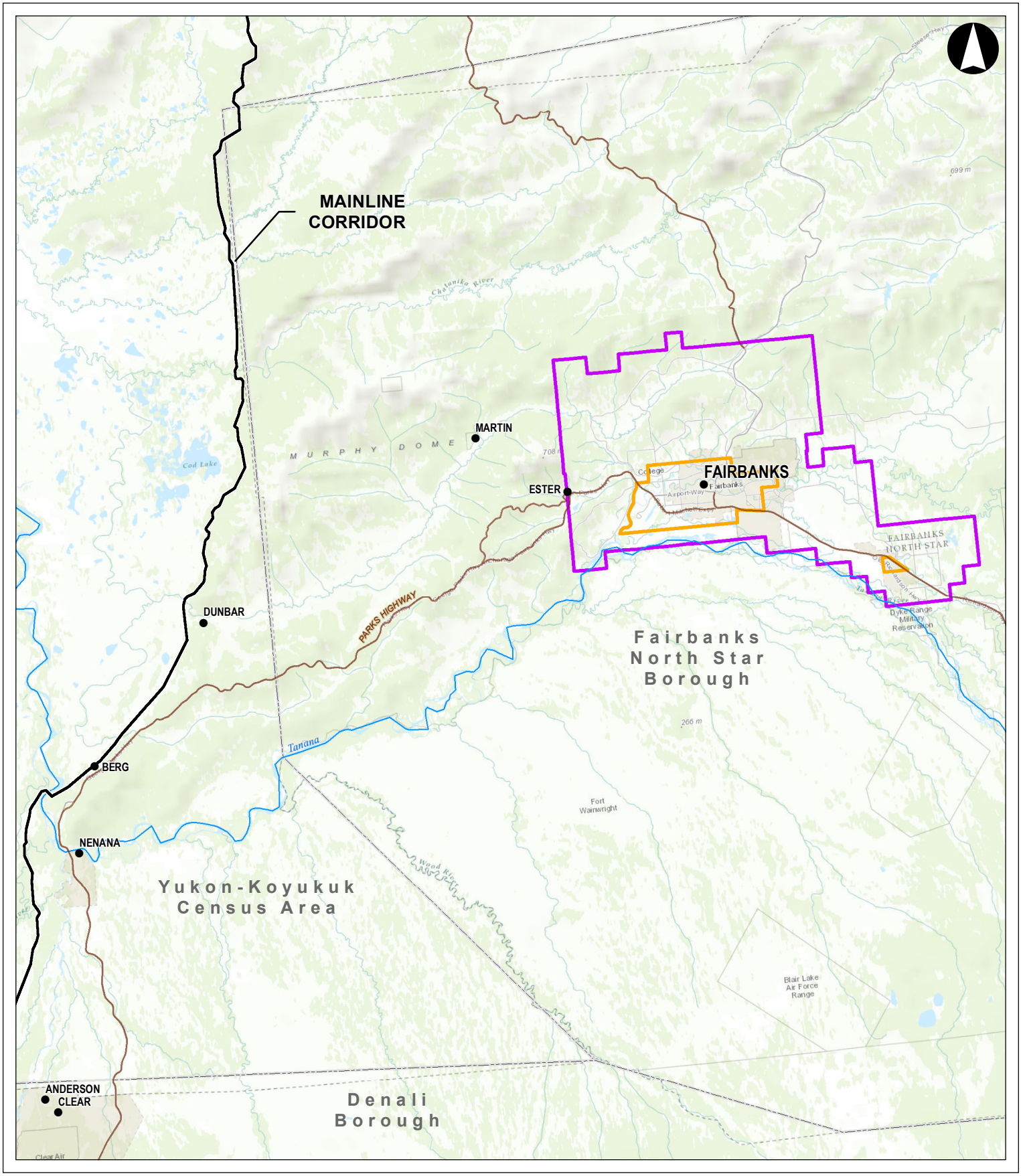
The Project area is currently designated as attainment or unclassified for all criteria pollutants. Although a short segment of the Mainline corridor extends into the Fairbanks North Star Borough, the location of the Project corridor is some 21 miles from the border of the established $PM_{2.5}$ non-attainment area and a greater distance from the Fairbanks CO maintenance area. Figures 9.2.2-1 and 9.2.2-2, respectively, provide the proximity of the Project to the Fairbanks and Anchorage non-attainment and maintenance areas.

Data obtained from ADEC for the North Slope were reviewed to characterize the existing air quality related to regulated criteria pollutants. Monitoring data from the PBU and PTU are shown in Table 9.2.2-2, including an indication of the specific site from which the data were collected. The data shown in this table are representative of the existing concentrations in the vicinity of the proposed GTP and represent a conservative estimate of air quality levels in the Project area north of the Brooks Range. The data demonstrate that existing air quality complies with the ambient standards.

Except for the area around Fairbanks, Interior Alaska is sparsely populated and has limited air quality monitoring data. Outside of the Fairbanks and Healy areas, there are few existing significant sources of air pollutants or human activities that emit air pollutants near the Project area. In addition to monitoring stations in the Fairbanks area, one other monitoring site, for O_3 only, is located at Denali National Park and would be the most representative existing location for estimating Interior O_3 levels.

Table 9.2.2-3 summarizes some recent publicly available monitoring data representative of existing air quality conditions in Interior Alaska.[4] The data demonstrate that existing air quality complies with the ambient standards. The available data will be reviewed with ADEC to determine whether it can be used for the pre-application ambient air analyses required for permitting purposes. If available data are not sufficient, additional data collection will occur at locations to be determined in consultation with ADEC.

[4] The $PM_{2.5}$ data will be investigated and addressed in a subsequent draft of this Resource Report.



LEGEND

- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- PM-2.5 Non-Attainment Area
- CO Maintenance Area
- Borough/ Census Area Boundary

0 3 6 12 Miles

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DATE:	2015-01-07	SHEET:	1 of 1

FAIRBANKS AIR QUALITY NON-ATTAINMENT AND MAINTENANCE AREAS

FIGURE 9.2.2-1

Alaska LNG

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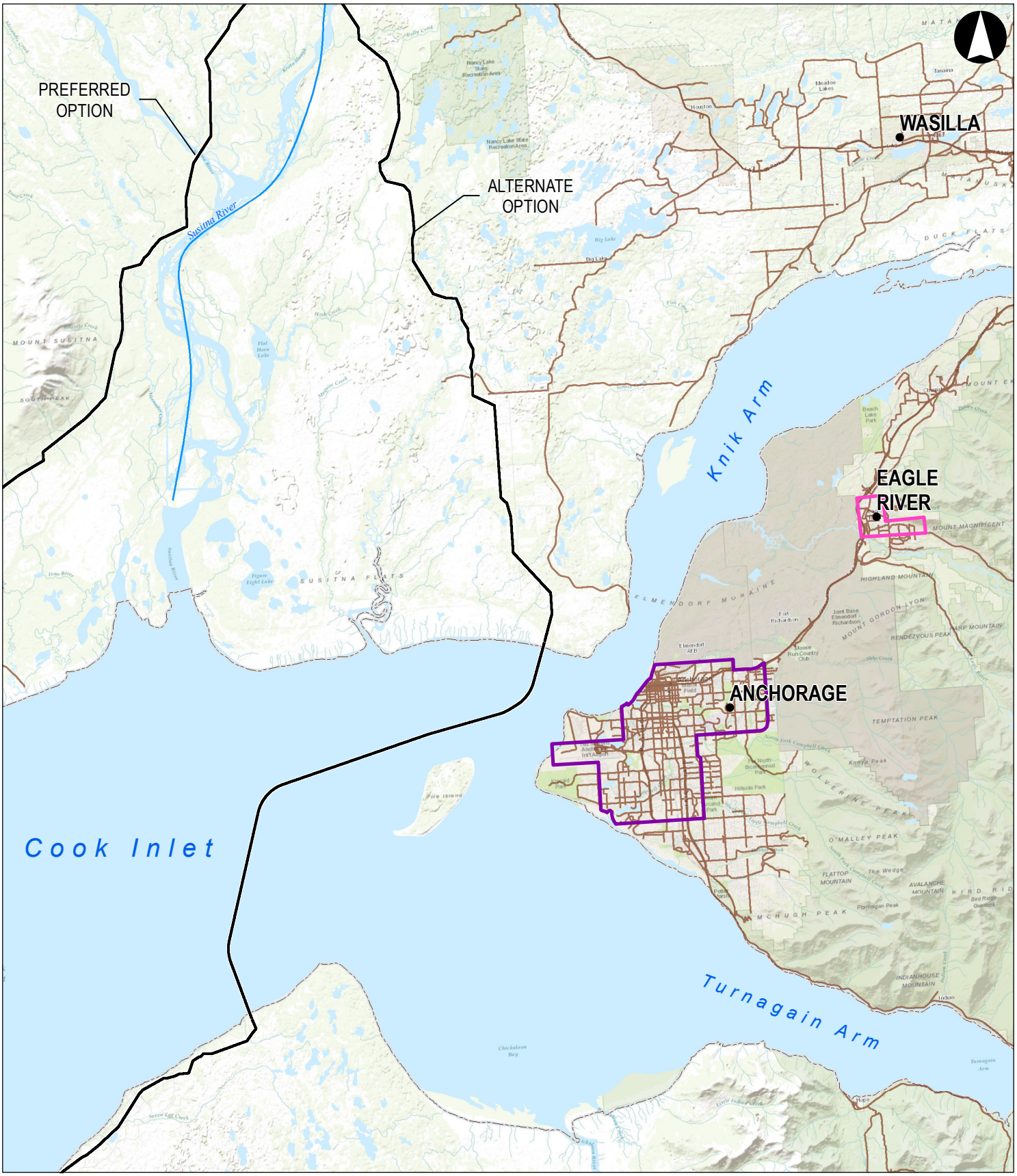

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_2_2-2 Anchorage Air Quality Maintenance Areas.mxd

LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Project Corridor
- Roads
- Borough/ Census Area Boundary
- CO Maintenance Area
- PM 10 Maintenance Area

0 2.5 5 10 Miles

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ANCHORAGE AIR QUALITY MAINTENANCE AREAS

FIGURE 9.2.2-2

Alaska LNG

TABLE 9.2.2-2

Monitored Air Quality Data from the North Slope

Air Pollutant	Averaging Period	Maximum Monitored Concentrations[a]	Site Location	Year
Sulfur Dioxide	1-Hour[b]	7.9 µg/m^3	A-PAD	2010-12
	1-Hour[b]	22.4 µg/m^3	Central Compression Plant	2010-12
	1-Hour[b]	6.1 µg/m^3	DS-1F	2013
	3-Hour	7.4 µg/m^3	A-PAD	2012
	3-Hour	38.4 µg/m^3	Central Compression Plant	2012
	3-Hour	6.4 µg/m^3	DS-1F	2013
	24-Hour	4.5 µg/m^3	A-PAD	2012
	24-Hour	25.9 µg/m^3	Central Compression Plant	2012
	24-Hour	3.0 µg/m^3	DS-1F	2013
	Annual	1.2 µg/m^3	A-PAD	20012
	Annual	1.4 µg/m^3	Central Compression Plant	2012
	Annual	0.4 µg/m^3	DS-1F	2013
Carbon Monoxide	1-Hour	1.36 mg/m^3	DS-1F	2013
	8-Hour	0.173 mg/m^3	DS-1F	2013
Nitrogen Dioxide	Annual	3.8 µg/m^3	A-PAD	2012
	Annual	11.2 µg/m^3	Central Compression Plant	2012
	Annual	7.0 µg/m^3	Point Thomson	2011
	Annual	4 µg/m^3	DS-1F	2013
	1-Hour[c]	66.3 µg/m^3	A-PAD	2010-12
	1-Hour[c]	139.2 µg/m^3	Central Compression Plant	2010-12
	1-Hour[c]	132.2 µg/m^3	Point Thomson	2011
	1-Hour[c]	40.6 µg/m^3	DS-1F	2013
Ozone	8-Hour[d]	0.046 ppmv	A-PAD	2010-12
	8-Hour[d]	0.043 ppmv	Central Compression Plant	2010-12
	8-Hour[d]	0.051 ppmv	DS-1F	2013
	8-Hour[d]	0.045 ppmv	Point Thomson	2011
Particulate Matter less than 10 Microns	24-hour	27.0 µg/m^3	Central Compression Plant	2012
	24-Hour	47 µg/m^3	DS-1F	2013
Particulate Matter less than 2.5 Microns	Annual	2.6 µg/m^3	Central Compression Plant	2012
	Annual	2.8 µg/m^3	DS-1F	2013
	24-Hour[e]	8 µg/m^3	Central Compression Plant	2011-12
	24-Hour[e]	7 µg/m^3	DS-1F	2013

Source: ADEC 2014b
Abbreviations:
µg/m^3 – micrograms per cubic meter
mg/m^3 – milligrams per cubic meter
ppmv – parts per million by volume
Notes:
[a] Concentrations for the short-term standards (1 to 24 hours) are based on the design calculations for the standards. See notes in Table 9.2.2-1
[b] The 1-hour SO_2 average shown in the table reflects the annual 99th percentile of the daily maximum 1-hour SO_2 concentration averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.
[c] The 1-hour average shown in the table reflects annual 98th percentile of the daily maximum 1-hour NO_2 concentration averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.
[d] The annual fourth-highest daily maximum 8-hour O_3 concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.
[e] The annual 98th percentile $PM_{2.5}$ concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.

TABLE 9.2.2-3

Monitored Air Quality Data from Interior Alaska and the Alaska Range

Air Pollutant	Averaging Period	Maximum Monitored Concentrations[a]	Site Location	Year
Sulfur Dioxide	1-hour	114.7 µg/m^3	809 Pioneer Rd, Fairbanks	2012-13
	3-Hour	102.4 µg/m^3	809 Pioneer Rd, Fairbanks	2013
	24-Hour	69.9 µg/m^3	809 Pioneer Rd, Fairbanks	2013
	Annual	21.7 µg/m^3	809 Pioneer Rd, Fairbanks	2004
Carbon Monoxide	1-Hour	4.4 mg/m^3	809 Pioneer Rd, Fairbanks	2013
	8-Hour	3.2 mg/m^3	809 Pioneer Rd, Fairbanks	2013
Nitrogen Dioxide	1-Hour[b]	126.4 µg/m^3	809 Pioneer Rd, Fairbanks	2013
	Annual	24.2 µg/m^3	809 Pioneer Rd, Fairbanks	2013
Ozone	8-Hour[c]	0.053 ppm	Denali National Park	2011-13
Particulate Matter less than 10 Microns	24-Hour	111.1 µg/m$^{3, d}$	809 Pioneer Rd, Fairbanks	2013
Particulate Matter less than 2.5 Microns	24-Hour[e] Annual	10.5 µg/m$^{3, d}$ 2.8 µg/m^3	Bettles Field Bettles Field	2011-13 2013

Sources: EPA 2014a; ADEC 2014b
Abbreviations:
µg/m^3 – micrograms per cubic meter
mg/m^3 – milligrams per cubic meter
ppm – parts per million
Notes:
[a] Concentrations for the short-term standards (1 to 24 hours) are based on the design calculations for the standards. See notes in Table 9.2.2-1.
[b] The daily maximum 1-hour 98th percentile NO_2 concentrations recorded during the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.
[c] The annual fourth-highest daily maximum 8-hour O_3 concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.
[d] PM_{10} and $PM_{2.5}$ data include possible exceptional events related to wildfires.
[e] The annual 98th percentile $PM_{2.5}$ concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.

Southcentral Alaska contains several ambient air quality monitoring sites, which may be representative of air quality conditions from the Alaska Range to the Cook Inlet area. Anchorage is Alaska's largest city, and there are several ambient air quality monitoring locations in and near Anchorage or other cities in this region. Publicly available data from these monitoring stations in Anchorage and the Kenai Peninsula are shown in Table 9.2.2-4. The monitoring data at these sites shows that the air quality attains the ambient standards, and since the locations are affected by urban emission sources, the data are conservative estimates of the air quality conditions at Southcentral locations in the Project area and across Cook Inlet.

Table 9.2.2-4 summarizes a portion of publicly available monitoring data in the vicinity of the Liquefaction Facility. Meanwhile, the Project has initiated an ambient air quality data collection program in the vicinity of the Liquefaction Facility. The air quality station location is shown in Figure 9.2.2-3. The data collection program began on January 1, 2015 and will continue for at least one year. Air quality data being collected at Nikiski include CO, NO_2, SO_2, O_3, PM_{10}, and $PM_{2.5}$. Prior to choosing this monitoring site and the air quality parameters, the Project consulted with the ADEC. When these data are available, they will be used to represent the Liquefaction Facility site in a subsequent draft of this Resource Report.

TABLE 9.2.2-4

Monitored Air Quality Data from Southcentral Alaska

Air Pollutant	Averaging Period	Maximum Monitored Concentrations[a]	Site Location	Year
Sulfur Dioxide	1-hour	No data available		
	3-Hour	13.1 µg/m^3	Beluga	1994
	3-Hour	351.8 µg/m^3	Tesoro Max	1995
	24-Hour	5.2 µg/m^3	Beluga	1994
	24-Hour	52.6 µg/m^3	Tesoro Max	1995
	Annual	2.6 µg/m^3	Beluga	1994
	Annual	1.8 µg/m^3	Tesoro Max	1995
Carbon Monoxide	1-Hour	5.1 mg/m^3	Anchorage	2013
	8-Hour	3.5 mg/m^3	Anchorage	2013
Nitrogen Dioxide	Annual	28.2 µg/m^3	Chugach International Station	2012
	Annual	14.8 µg/m^3	Swanson River	2009
	Annual	4.9 µg/m^3	Trading Bay	2009
	1-Hour[b]	151.8 µg/m^3	Chugach International Station	2012
	1-Hour[b]	134.5 µg/m^3	Swanson River	2009
	1-Hour[b]	34.4 µg/m^3	Trading Bay	2009
Ozone	8-Hour[c]	0.047 ppm	Chugach International Station	2012
	8-Hour[c]	0.060 ppm	Agrium	2014
Particulate Matter less than 10 Microns	24-Hour	84 µg/m^3	Soldotna	2013
	24-Hour	114 µg/m^3	Agrium	2014
Particulate Matter less than 2.5 Microns	24-Hour[d]	8 µg/m^3	Soldotna	2011-13
	24-Hour[d]	8 µg/m^3	Agrium	2014
	Annual	0.9 µg/m^3	Soldotna	2013

TABLE 9.2.2-4

Monitored Air Quality Data from Southcentral Alaska

Air Pollutant	Averaging Period	Maximum Monitored Concentrations[a]	Site Location	Year
	Annual	3.6 µg/m^3	Agrium	2014

Sources: EPA 2014a; ADEC 2014b

Abbreviations:

µg/m^3 = micrograms per cubic meter

ppm = parts per million

Notes:

[a] Concentrations for short-term standards (1 to 24 hours) are based on the design calculations for the standards. See notes in Table 9.2.2-1.

[b] The daily maximum 1-hour 98th percentile NO_2 concentrations recorded during the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.

[c] The annual fourth-highest daily maximum 8-hour O_3 concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.

[d] The annual 98th percentile $PM_{2.5}$ concentrations averaged over the specified monitoring period are provided for informational purposes; and for PSD-quality determination purposes for future permitting projects.

9.2.3 Air Quality Emissions from Operation of Stationary Sources

Federal and state air quality regulations govern emissions of criteria air pollutants, hazardous air pollutants (HAPs), some state-only specified pollutants (total reduced sulfur and ammonia), volatile organic compounds in general, ozone-depleting substances, and greenhouse gases (GHG) in certain cases. Under its New Source Review (NSR) and Title V operating permit programs, the ADEC issues construction and/or operating permits to new, modified, and existing stationary sources or facilities. These permits establish terms and conditions for compliance with air quality standards, require compliance with source-specific emission standards, and provide a monitoring, recordkeeping, and reporting mechanism to verify continued compliance. Specific air permitting and regulatory requirements are discussed in Section 9.2.5.

LEGEND

- Ambient Air Monitoring Station
- Major Highways

0 0.25 0.5 Miles

DISCLAIMER

The information contained herein is for informational or planning purposes only, It does not nor should it be deemed to be an offer, request or proposals for rights or occupation of any kind. The Alaska LNG Project Participants and their respective officers, employees and agents, make no warranty, implied or otherwise, nor accept any liability, as to the accuracy or completeness of the information contained in these documents, drawings or electronic files. Do not remove or delete this note from document, drawing or electronic file.

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SCALE:	1:24,000		
DATE:	2015-01-08	SHEET:	1 of 1

LIQUEFACTION FACILITY AMBIENT AIR MONITORING STATION LOCATION

FIGURE 9.2.2-3

Alaska LNG

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_2_2-3 Liquefaction Facility Ambient Air Monitoring Station Location.mxd

A summary of estimated short-term (pounds per hour) and annual (tons/year) average emissions from Project sources for criteria air pollutants, as well as other emissions that are specifically regulated, will be presented in a subsequent draft of this Resource Report. Estimated emissions associated with maintenance, startup, and shutdown will be provided as well. Subsequent drafts of this Resource Report will also include an appendix that provides information on how the operational emissions of the Project were calculated.

9.2.3.1 Liquefaction Facility

Natural gas delivered via the Mainline will flow from the LNG Plant receipt point (plant inlet flange) through a pressure letdown station and undergo flow control, separation, and filtration. Molecular sieve dehydration beds will remove water vapor, and mercury guard beds will reduce the mercury to levels that meet the liquefaction system equipment specifications. The natural gas will be liquefied through a combination of heat exchange and pressure reduction using Air Products and Chemicals Inc. (APCI) patented technology. Heavy hydrocarbons that can freeze in the cryogenic unit are removed at an optimum location within the processing operations. LNG is then transferred to the LNG storage tanks for subsequent delivery to LNG carriers. The processing operations may include but are not limited to the following general sources of emissions:

- Natural gas fired turbine driven or motor driven compressors;
- Natural gas-fired or steam turbines for power generation;
- Mole-sieve regenerators and a backup fired heater;
- Emergency and routine flare systems;
- Condensate truck loading facilities; and
- Condensate, LNG, and refrigerant storage tanks.

Once the Pre-FEED design is available, short-term and annual emissions from operation of this equipment, including fugitive emissions and potentially HAPs, will be provided in Table 9.2.3-1 in a subsequent draft of this Resource Report. Emissions will be based on worst-case assumptions regarding performance and maximum facility design capacities, using vendor-supplied emission data where available. The estimated emissions will include emissions from normal operation of the Liquefaction Facility, as well as on-road and off-road support equipment and vehicles. One meter station associated with delivery of natural gas from the Mainline to the Liquefaction Facility will also be included in these emissions.

TABLE 9.2.3-1

Estimated Emissions from the Liquefaction Facility

Pollutant	Project Potential to Emit (pounds per hour)	Project Potential to Emit (tons per year)
Nitrogen Oxides (NO_X)		
Carbon Monoxide (CO)		

TABLE 9.2.3-1

Estimated Emissions from the Liquefaction Facility

Pollutant	Project Potential to Emit (pounds per hour)	Project Potential to Emit (tons per year)
Volatile Organic Compounds (VOCs)		
Particulate Matter (PM_{10})		
Particulate Matter ($PM_{2.5}$)		
Sulfur Dioxide (SO_2)		
Lead (Pb)		
Largest Individual Hazardous Air Pollutant (Formaldehyde)		
Total Hazardous Air Pollutants (HAPs)		
Carbon Dioxide (CO_2)[a]		
Nitrous Oxide (N_2O)[a]		
Methane (CH_4)[a]		
Total Greenhouse Gas Emissions (CO_2e)[a,b]		
_____		

[a] Annual emissions are given in tons per year.

[b] The total GHG emissions are calculated as CO_2 equivalent (CO_2e) emissions, i.e., the sum of individual GHGs with the annual tons of each gas multiplied by its Global Warming Potential (GWP) relative to CO_2. CH_4 is converted to CO_2e by multiplying its emissions by the GWP of 25, and N_2O is converted to CO_2e by multiplying its emissions by the GWP of 298.

9.2.3.2 Interdependent Facilities [5]

Compressor Stations

The preliminary design for all compressor stations is similar and will most likely include the following emission units:

- One natural gas-fired compressor turbine;
- Two natural gas-fired generators turbines;
- One emergency natural gas fired standby generator;
- One natural gas-fired process heater;
- One natural gas-fired standby heater; and

[5] As used in this Resource Report and throughout these Resource Reports, "Interdependent Facilities" is used in relation to the definition of LNG terminal under the NGA.

- One natural gas-fired waste handling incinerator.

Fugitive emissions of organic compounds, including some HAPs, will likely come from piping components and connectors throughout the compressor station. Table 9.2.3-2 will list the preliminary estimated operational emissions from normal operation of each compressor station's preliminary design.

TABLE 9.2.3-2

Estimated Air Emissions from Operations of each Compressor Station

Pollutant	Project Potential to Emit (pounds per hour)	Project Potential to Emit (tons per year)
Nitrogen Oxides (NO_X)		
Carbon Monoxide (CO)		
Volatile Organic Compounds (VOCs)		
Particulate Matter (PM_{10})		
Particulate Matter ($PM_{2.5}$)		
Sulfur Dioxide (SO_2)		
Lead (Pb)		
Largest Individual Hazardous Air Pollutant (Formaldehyde)		
Total Hazardous Air Pollutants (HAPs)		
Carbon Dioxide (CO_2)[a]		
Nitrous Oxide (N_2O)[a]		
Methane (CH_4)[a]		
Total Greenhouse Gas Emissions (CO_2e)[a,b]		
_____		

[a] Annual emissions are given in tons per year.

[b] The total GHG emissions are calculated as CO_2 equivalent (CO_2e) emissions, i.e., the sum of individual GHGs with the annual tons of each gas multiplied by its Global Warming Potential (GWP) relative to CO_2.

Once the Pre-FEED design is available, individual emission calculations will be determined for each compressor station and provided in a subsequent draft of this Resource Report. Emissions may differ slightly from location to location due to elevation and final design considerations.

Heater Stations

The current design of the Project requires heater stations to maintain natural gas temperature above the minimum value in colder seasons. Pipeline gas enters the station and flows through a number of identical trains configured in a parallel arrangement. The heaters are fired on pipeline natural gas. Units could operate up to 24 hours per day during the colder seasons and during periods of cold weather at any time during the year. Table 9.2.3-3 will provide estimated hourly and annual emission rates from these sources. Once the Pre-FEED design is available, individual emission calculations will be determined for the heater stations and provided in a subsequent draft of this Resource Report.

TABLE 9.2.3-3

Estimated Air Emissions from Operations of each Heater Station

Pollutant	Project Potential to Emit (pounds per hour)	Project Potential to Emit (tons per year)
Nitrogen Oxides (NO_X)		
Carbon Monoxide (CO)		
Volatile Organic Compounds (VOCs)		
Particulate Matter (PM_{10})		
Particulate Matter ($PM_{2.5}$)		
Sulfur Dioxide (SO_2)		
Lead (Pb)		
Largest Individual Hazardous Air Pollutant (Formaldehyde)		
Total Hazardous Air Pollutants (HAPs)		
Carbon Dioxide (CO_2)[a]		
Nitrous Oxide (N_2O)[a]		
Methane (CH_4)[a]		
Total Greenhouse Gas Emissions (CO_2e)[a,b]		
_____		

[a] Annual emissions are given in tons per year.

[b] The total GHG emissions are calculated as CO_2 equivalent (CO_2e) emissions, i.e., the sum of individual GHGs with the annual tons of each gas multiplied by its Global Warming Potential (GWP) relative to CO_2.

Other Above-Ground Pipeline Facilities

Fugitive emissions of organic compounds, including methane, which is a GHG, will likely come from piping components and connectors along the pipelines (Mainline, PTTL, and PBTL). The Interstate Natural Gas Association of America has created guidance for calculating methane (CH_4) and CO_2 leak emissions, both considered GHG emissions, from a natural gas pipeline. The methodology utilizes the length of the above-ground pipeline, based on the assumption of cathodic protection, and the number of meter stations to determine an estimate of the annual fugitive emissions. In a subsequent draft of this Resource Report, Table 9.2.3-4 will provide the estimated annual fugitive GHG emissions for these pipeline operations (excluding the GTP and compressor station fugitives, which are included in those facilities).[6]

Mainline block valve operations and pig launching and receiving operations will also occur at specific sites along the pipelines. Such operations are well controlled and are not expected to lead to emissions relevant to any permitting threshold or other concern; and this factor will be confirmed based on final

[6] The other three meter stations are located within the Liquefaction Facility boundaries (one station) and within the GTP boundaries (two stations) and will be accounted for in emissions from those facilities.

design and operations. Fugitive emissions from valve operations will be covered in this section of a subsequent draft of this Resource Report if applicable.

TABLE 9.2.3-4

Estimated Pipeline Fugitive Greenhouse Gas Emissions

Pollutant	Segment	Emission Factor [a,b]	Emissions (tons per year)
MAINLINE			
Methane (CH_4)	Meter/Regulator		
	Pipeline Length		
Carbon Dioxide (CO_2)	Meter/Regulator		
	Pipeline Length		
CO_2 from CH_4 Oxidation	Pipeline Length		
Total Greenhouse Gas Emissions (CO_2e)[c]			
PTTL			
Methane (CH_4)	Meter/Regulator		
	Pipeline Length		
Carbon Dioxide (CO_2)	Meter/Regulator		
	Pipeline Length		
CO_2 from CH_4 Oxidation	Pipeline Length		
Total Greenhouse Gas Emissions (CO_2e)[c]			
PBTL			
Methane (CH_4)	Meter/Regulator		
	Pipeline Length		
Carbon Dioxide (CO_2)	Meter/Regulator		
	Pipeline Length		
CO_2 from CH_4 Oxidation	Pipeline Length		
Total Greenhouse Gas Emissions (CO_2e)[c]			

a The meter/regulator emission factor is in units of pounds per station per year.

b The pipeline length emission factor is in units of pounds per mile per year.

c The total GHG emissions are calculated as CO_2e emissions, i.e., the sum of individual GHGs with the annual tons of each gas multiplied by its GWP relative to CO_2.

Source: Interstate Natural Gas Association of America 2005, Table 4-3 and Table W-7 from 40 CFR Part 98 Subpart W.

GTP

The preliminary design of the GTP consists of three identical gas processing trains that perform carbon dioxide (CO_2) and hydrogen sulfide (H_2S) removal as a combined byproduct stream, and water removal. Refer to Resource Report No. 1 for a detailed description of GTP activities.

Emissions of air pollutants will result from operation equipment which could include:

- Natural gas-fired sales gas compressor turbines;
- Natural gas-fired CO_2 compressor turbines;
- Natural gas-fired power generator turbines;
- Natural gas-fired essential power generator turbines;
- Natural gas-fired heat medium auxiliary heater;
- Natural gas-fired heat medium heaters;
- Diesel-fired essential generators;
- Diesel-fired emergency generator;
- Diesel-fired air compressor;
- Diesel-fired firewater pump;
- Low pressure CO_2 flares;
- High pressure CO_2 flares;
- Low pressure hydrocarbon flares;
- High pressure hydrocarbon flares;
- Natural gas-fired waste handling incinerators; and
- Aboveground storage tanks.

Fugitive emissions of organic compounds, including some HAPs, will likely come from piping components and connectors throughout the GTP. Once the Pre-FEED design is available, short-term and annual emissions from operations of this equipment, including fugitive emissions, will be provided in Table 9.2.3-5 in a subsequent draft of this Resource Report. The estimated emissions will include emissions from normal operation of the GTP, as well as on-road and off-road support equipment and vehicles.

TABLE 9.2.3-5

Estimated Air Emissions from Operations of the GTP

Pollutant	Project Potential to Emit (lbs/hr)	Project Potential to Emit (tons/year)
Nitrogen Oxides (NO_X)		
Carbon Monoxide (CO)		
Volatile Organic Compounds (VOCs)		
Particulate Matter (PM_{10})		
Particulate Matter ($PM_{2.5}$)		
Sulfur Dioxide (SO_2)		
Lead (Pb)		
Largest Individual Hazardous Air Pollutant (Formaldehyde)		
Total Hazardous Air Pollutants (HAPs)		
Carbon Dioxide (CO_2)[a]		
Nitrous Oxide (N_2O)[a]		
Methane (CH_4)[a]		
Total Greenhouse Gas Emissions (CO_2e)[a,b]		
_____		

[a] Annual emissions are given in tons per year.

[b] The total GHG emissions are calculated as CO_2 equivalent (CO_2e) emissions, i.e., the sum of individual GHGs with the annual tons of each gas multiplied by its Global Warming Potential (GWP) relative to CO_2.

9.2.4 LNG Carriers

Marine vessels (both LNGCs and support vessels) will be used to transport LNG from the Marine Terminal down Cook Inlet to various international destinations. Additional information on vessel emissions will be provided when it is available in a subsequent draft of this Resource Report. Marine Vessels operating in US waters are generally required to obtain an *Engine International Air Pollution Prevention* (EIAPP) *Certificate* under Annex VI of the Marine Pollution Protocol (MARPOL) or provide evidence of conformity to MARPOL Annex VI. Compliance requirements for various potentially applicable regulations could include engine design data, certifications, date of engine manufacture, emissions test data, and in-use fuel specifications, including sulfur limits in fuel.

9.2.5 Applicable Air Quality Regulatory Requirements[7]

This section provides an overview of applicable regulations and a discussion regarding the expected compliance requirements. The programs discussed below are implemented by ADEC, which is the

[7] This summary reflects the United States Supreme Court decision in *UARG v. EPA*, 573 U.S. __ (2014) and the July 24, 2014 EPA Guidance indicating that EPA will no longer treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit.

delegated agency for federal air programs and is the regulatory agency for state-only programs. Final applicability determinations will be made based on final facility design.

9.2.5.1 New Source Review (NSR) and Prevention of Significant Deterioration (PSD)

Ambient air quality is protected in part by an air quality permitting program for new sources and modifications to existing sources. This program is implemented by ADEC and addresses the federal NSR regulations, as well as state regulations. Separate programs are in place to issue permits for major sources and minor sources. The federal NSR program for major sources consist of rules for issuing pre-construction permits for attainment area pollutants (known as the PSD rules) and non-attainment area pollutants (known as the non-attainment NSR (NNSR) rules). The Project will be located in areas that are in attainment with, or unclassified with respect to, the ambient standards for all pollutants; therefore, only PSD will apply for permitting major sources within the Project. EPA has approved Alaska's PSD rules allowing ADEC to implement PSD (see 18 AAC 50.306 and 40 C.F.R. § 52.21).

A stationary source is considered a "major source" if the source's "potential to emit," which is its capability at maximum design capacity to emit a pollutant, except as constrained by federally enforceable permit conditions, exceeds certain emission thresholds. Under the PSD rules, a "major stationary source" is one that emits or has the potential to emit:

- For a categorical list of 28 sources (40 C.F.R. § 52.21[b][1][i][a]), 100 tons per year (tpy) or more of any regulated air contaminant (other than GHGs) in an area designated attainment for that air contaminant; or

- For other sources, 250 tpy or more of any regulated air contaminant (other than GHGs) in an area designated attainment for that air contaminant.

The sources proposed as part of the Project are not included on the categorical list, and, therefore, 250 tpy is the threshold for determining major source status under PSD for all criteria pollutants for new sources installed as part of the Project. Final facility design information will be needed to determine if new Project sources exceed the threshold for major source status.

If a new source or modification is "major," PSD review and permitting is required for associated regulated pollutants emitted in amounts equal to or greater than the applicable "significance levels." The PSD significance levels are specified in 40 C.F.R. § 52.21(b) (23) (i) as follows: 40 tpy for NO_X, SO_2, and Volatile Organic Compounds (VOCs); 100 tpy for CO; 15 tpy for PM_{10}; 10 tpy for $PM_{2.5}$; and lesser amounts for other listed pollutants. For PSD facilities within 10 kilometers of a Class I area, an additional review applies to a new major stationary source that has emissions that will increase the 24-hour average concentration of any regulated pollutant in that area by 1 microgram per cubic meter ($\mu g/m^3$) or greater.

GHG emissions may be regulated if the source triggers PSD through other pollutants and the total CO_2e emissions (or increase) are above 75,000 tpy. CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its GWP for the following six gases:

- CO_2;

- Nitrous oxide (N_2O);

- Methane (CH_4);
- Hydroflurocarbons;
- Perfluorocarbons; and
- Sulfur hexafluoride.

If PSD review applies, a PSD permit application must address the following requirements:

- Apply Best Available Control Technology (BACT) for each regulated pollutant for which the major modification would result in a significant net emissions increase (§ 52.21[j][3]);
- Conduct an air quality impact analysis that establishes the maximum modeled impact and demonstrates emissions associated with the proposed new source or modification, in conjunction with all other emission increases and decreases, will not cause or contribute to violations of any NAAQS or allowable PSD increment (§ 52.21[k]);
- Provide an ambient air analysis based on current data collected in the vicinity of the project (§ 52.21[m]);
- Provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the stationary source and general commercial, industrial, residential and other growth associated with the stationary source (§ 52.21[o][1]);
- Provide an analysis of the projected additional air quality impact as a result of general commercial, industrial, residential, and other growth associated with the stationary source (§ 52.21[o][2]); and
- Provide an analysis of the impacts to air quality and air quality-related values at nearby Class I areas (§ 52.21[p]), if applicable.

Adequate design and emissions data for Project facilities, including emission control technology and control effectiveness and operational limits, are not yet available to determine the applicability of PSD permitting requirements. The applicability of PSD permitting for any facility will be provided in a subsequent draft of this Resource Report when more specific emissions information is available.

9.2.5.2 Minor New Source Review Permits

For new sources, a minor permit is required under 18 AAC 50.502(c) (1) if (1) the source is not a major source, and (2) the potential to emit one or more criteria pollutants exceeds the following:

- 15 tpy of PM_{10};
- 40 tpy of NO_X;
- 40 tpy of SO_2;

- 0.6 tpy of Pb;
- 100 tpy of CO within 10 kilometers of a CO non-attainment area; or
- 10 tpy of direct $PM_{2.5}$.

The compressor stations are not expected to be major sources but are likely to exceed the minor source pollutant thresholds. Therefore, these sources must receive minor source permits from ADEC prior to commencement of construction. Final design data will be used to confirm applicability of the minor source permitting requirements.

9.2.5.3 Title V Operating Permits

Title V of the CAA requires that sources which emit over 100 tpy of any criteria air pollutant obtain an operating permit under this rule. ADEC has delegated responsibility to implement Title V pursuant to 18 AAC Part 50.326. A new source must apply for an operating permit within 12 months of the start of operation.

The applicability of Title V air permitting for any facility will be assessed in a subsequent draft of this Resource Report when more specific emissions information and site locations are available.

9.2.5.4 Other Alaska Air Quality Regulations

Listed below is a preliminary indication of what may apply under other Alaska Air Quality Regulations, based upon the preliminary design of the facilities. Final applicability determinations will be made based on final facility design.

18 AAC 50.055(c) limits the air emissions of sulfur compounds, expressed as SO_2, to 500 parts per million averaged over three hours. This rule applies to industrial processes and fuel-burning equipment and will be applicable to the GTP and each compressor station.

18 AAC 50.050(a) and 50.055(b) limit the visible and particulate matter emissions and opacity of emissions from industrial processes and fuel-burning equipment. The fuel-burning equipment and other industrial processes will not emit exhaust gases with greater than 20 percent opacity, as required under this provision.

18 AAC 50.065 establishes limits for open burning. If open burning will be used, the provisions of 18 AAC 50.065 will be applicable.

18 AAC 50.070 limits visible emissions from all marine vessels within three miles of the Alaska coastline. The rule generally requires opacity less than 20 percent except for specified short periods and up to 40 percent for a complete hour related to periods of weighing anchor or casting off.

18 AAC 50.080 establishes limits for industrial processes, fuel-burning equipment, and incinerators in areas of potential ice fog. These limits may affect the GTP, Liquefaction Facility, heater stations, and the compressor stations and will be determined on a case-by-case basis.

18 AAC 50.215 exempts concentrations attributable to a temporary construction activity from ambient air quality analyses. As such, the construction related to pipeline spreads, compressor stations, construction camps, and heater station sites may not need to be included in ambient air quality analyses.

18 AAC 50.990 defines "Temporary Construction Activities" as construction that is completed in 24 months or less from the date construction begins. As such, construction activities will qualify as temporary under air quality regulations, if completed within this time frame.

9.2.5.5 New Source Performance Standards (NSPS)

Pursuant to Section 111 of the CAA, EPA promulgates NSPS for newly constructed, modified, or reconstructed sources of emissions of criteria pollutants. These standards are set based on best demonstrated technology for air pollution control of specified equipment and may be expressed as numerical emission limits, performance standards, or work practices. The regulations are published in 40 C.F.R. Part 60. Subpart A of Part 60 establishes general provisions for sources subject to the various NSPS subparts, including general performance testing, monitoring, notification, reporting, and recordkeeping requirements.

A preliminary analysis of NSPS that likely would apply to the proposed Project facilities is set forth below. Final applicability determinations will be made based on final facility design.

Liquefaction Facility

The Liquefaction Facility would be subject to the flare design requirements of Subpart A for the flares if they burn off gases from other units regulated by NSPS. This subpart restricts visible emissions from flares, and requires the documentation of design data to ensure proper flare operation.

NSPS Subparts Da, Db, or Dc regulate emissions from industrial, commercial, and institutional steam generating units, and may apply to the facility if gas-fired steam generating units (or units that heat other liquids such as oil or glycol for process operations) are included in the facility design. These subparts do not apply to direct process heater operations. Final applicability determination will be made on facility design.

NSPS Subparts IIII and JJJJ could apply to new, modified, or reconstructed compression-ignition or spark-ignition engines installed and operated at the Liquefaction facility, potentially including compressors, generators, emergency fire water pumps and emergency generators. These regulations include standards for the emission of NO_X, CO and VOCs from such units, and emissions are based on equipment size and operation.

NSPS Subpart KKKK applies to all new, modified or reconstructed gas-fired turbines with a heat input at peak load equal to or greater than 10 MMBtu/hour. The combustion turbines, and any associated emissions from a combined turbine and heat recovery steam generator will be subject to the NO_X and SO_2 emission requirements under this Subpart.

NSPS Subpart Kb may apply to storage vessels greater than 10,000 gallons storage capacity for vessels related to the storage of volatile organic compounds, including fuels or process liquids that are not stored in pressurized tanks.

NSPS Subpart OOOO establishes standards for equipment leaks of VOC from onshore natural gas processing plants. Subpart OOOO may be applicable to the Liquefaction Facility if gas treatment is required. This rule replaces the former standards for new units, which were under Subpart KKK. It applies to centrifugal and reciprocating compressors, pneumatic controllers, and storage vessels located at natural gas processing plants.

Interdependent Facilities

Compressor Stations

If present, diesel fired engines at these sites may be subject to Subpart IIII for stationary compression ignition internal combustion engines, which also regulate NO_X, CO and VOC emissions.

NSPS Subpart KKKK applies to all new, modified, or reconstructed turbines with a heat input at peak load equal to or greater than 10 MMBtu per hour. The combustion turbines located at each compressor station will be subject to the NO_X and SO_2 requirements of this subpart.

NSPS Subpart OOOO will apply to limit VOC emissions from centrifugal and reciprocating compressors, pneumatic controllers, and storage vessels at the compressor stations.

Heater Stations

NSPS Subparts Da, Db, or Dc regulate emissions from industrial, commercial, and institutional steam generating units, and may apply to the facility if gas-fired steam generating units (or units that heat other liquids such as oil or glycol for process operations) are included in the facility design. These subparts do not apply to direct process heater operations. Final applicability determination will be made on facility design.

NSPS Subparts IIII and JJJJ could apply to new, modified, or reconstructed compression-ignition or spark-ignition engines if installed and operated at the heater stations. These regulations include standards for the emission of NO_X, CO and VOCs from such units and emissions are based on equipment size and operation.

Meter Stations

Information regarding regulatory applicability for meter stations will be provided in a subsequent draft of this Resource Report.

GTP

The GTP would be subject to the flare design requirements of Subpart A for the flares if they burn off gases from other units regulated by NSPS. This subpart restricts visible emissions from flares, and requires the documentation of design data to ensure proper flare operation.

NSPS Subpart Db, or Dc applies to industrial, commercial, institutional steam-generating units listed in 40 C.F.R. §§ 60.40b to 60.49b, inclusive. The natural gas-fired heaters with a heat input of greater than 100 million British thermal units (MMBtu per hour) will be subject to the NO_X requirements of Subpart Db. There are no emission limits under Subpart Dc for natural gas fired units.

NSPS Subpart IIII applies to stationary compression ignition internal combustion engines and diesel generator engines at the GTP. The requirements of this Subpart include emission standards for NO_X, CO and VOCs, along with diesel fuel specifications, monitoring, and recordkeeping.

NSPS Subpart KKKK applies to all new, modified, or reconstructed turbines with a heat input at peak load equal to or greater than 10 MMBtu per hour. The combustion turbines of the GTP will be subject to the NO_X and SO_2 emission standards of this subpart.

The GTP is also subject to the requirements of NSPS Subpart LLL, which is the NSPS for Onshore Natural Gas Processing: SO_2 emissions.

NSPS Subpart OOOO establishes standards for equipment leaks of VOC from onshore natural gas processing plants. Subpart OOOO is applicable to the GTP and replaces the former standards for new units, which were under Subpart KKK. It may also apply to centrifugal and reciprocating compressors, pneumatic controllers, and storage vessels located across other facilities.

NSPS Subpart VVa requirements are referenced in NSPS Subpart OOOO for process equipment. This rule establishes standards for equipment leaks of VOC from synthetic organic chemical manufacturing facilities, but is referenced by other NSPS regulations. NSPS Subpart VVa incorporates many of the basic requirements of Subpart VV, with some exceptions such as detection levels for determining leaking equipment. Therefore, Project operations will incorporate applicable provisions of Subpart VVa.

9.2.5.6 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

The 1970 CAA required the EPA to develop health risk-based standards for regulating HAP emissions. These regulations are known as NESHAPs and are codified in 40 C.F.R. Part 61. These standards apply to specific pollutants and source categories. None of the facilities included in the Project will be subject to the 40 C.F.R. Part 61 NESHAPs because none of the regulated operations in that Part are included in the Project.

The 1990 CAA Amendments expanded EPA's obligation to regulate HAPs and required EPA to set technology-based standards for a larger list of HAPs and for many more source categories. These NESHAPs are codified in 40 C.F.R. Part 63 and are known as the maximum achievable control technology (MACT) standards. MACT standards are applicable if a source has the potential to emit more than 10 tpy of a single HAP and more than 25 tpy of all HAPs combined. Subpart A of Part 63 provides the general provisions of the MACT standards. These include such requirements as monitoring, notification, and reporting requirements for sources subject to subparts discussed below. Each subpart provides a table identifying which general provisions apply to that subpart. Certain MACT standards in 40 C.F.R. Part 63 may be applicable as summarized below. Final applicability determinations will be made based on final facility design.

Liquefaction Facility

Subpart DDDDD applies to boilers and process heaters at major sources of HAPs; however, because the Liquefaction Facility heaters burn only natural gas, the affected units under Subpart DDDDD in its current form will be subject to work practice standards, rather than emission limits for specific HAPs. Initial notification requirements would be applicable for affected sources.

Subpart YYYY applies to existing, new, or reconstructed stationary lean pre-mix or diffusion pre-mix design stationary combustion turbines at major stationary sources of HAPs. Pending further design specifications, it is possible that the Liquefaction Facility may be a major source of HAPs (as discussed above). Subpart YYYY would limit emission of formaldehyde from these units and include other specific operational requirements. Emissions from any associated duct firing related to a heat recovery steam generator may be included in this limitation.

Subpart ZZZZ applies to emissions from both spark-ignition and compression-ignition reciprocating internal combustion engines at area sources and major sources. If an engine at an area source is subject to NSPS Subpart IIII or JJJJ or is less than specified criteria in § 63.6590(c), and also subject to NSPS Subparts IIII or JJJJ, then that engine is exempt from this regulation.

Interdependent Facilities

Compressor Stations

Subpart YYYY applies to stationary combustion turbines at major stationary sources of HAPs, although turbines located on the North Slope are exempt from the requirements of this subpart, except for the initial notification requirements. Pending further design specifications, it is not likely that compressor stations are major sources of HAPs, and therefore this rule would not apply to these sites.

Meter Stations

Meter stations do not include potential sources that are affected by MACT standards.

Heater Stations

Given the preliminary heater station design, the only NESHAPs potentially applicable would be Subpart ZZZZ for internal combustion engines. However, given that these sites are not likely to be major sources of HAPs, compliance with NSPS Subparts IIII or JJJJ would meet the requirements for compliance with Subpart ZZZZ. No further requirements under Subpart ZZZZ apply for such engines under this part.

GTP

Emission sources within the GTP include combustion turbines, reciprocating engines, heaters, dehydration units, flares, and fugitive equipment leaks. The GTP could have potential HAP emissions greater than the major source thresholds for a single HAP (10 tpy), as summarized in Table 9.2.4-5. GTP is potentially subject to subparts A, H, HH, YYYY, and DDDDD of 40 C.F.R. Part 63.

Subpart DDDDD applies to boilers and process heaters at major sources of HAPs. However, because the GTP fired heaters burn natural gas, the affected units under Subpart DDDDD in its current form will be subject to work practice standards, rather than emission limits for specific HAPs. Initial notification requirements would be applicable for affected sources.

Subpart H establishes a leak detection and repair program for pumps, compressors, agitators, pressure-relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems, and control devices or closed-vent systems required

by Subpart H that are intended to operate in organic HAP service. Subpart H includes equipment design requirements as well as leak detection and repair.

Subpart HH applies to oil and natural gas production facilities that process, upgrade, or store either natural gas or hydrocarbon liquids. The affected sources for major sources of HAPs are the glycol dehydration units, storage vessels with potential flash emissions, and ancillary equipment intended to operate in volatile HAP service. The GTP will include dehydration units and associated ancillary equipment. This equipment is potentially subject to Subpart HH. Subpart HH establishes emission control as well as monitoring and recordkeeping requirements for glycol dehydration units and storage vessels with potential flash emissions. Any equipment that is subject to Subpart HH and NSPS Subpart KKK must only comply with NSPS Subpart KKK.

Subpart HHH applies to natural gas transmission and storage facilities that are major sources of HAPs. Subpart HHH states that a compressor station that transports natural gas prior to the point of custody transfer or to a natural gas processing plant (if present) is not considered a part of the natural gas transmission and storage source category. Therefore, the GTP is potentially subject to 40 C.F.R. Part 63 Subpart HH for natural gas processing plants rather than Subpart HHH.

Subpart YYYY applies to stationary combustion turbines at major stationary sources of HAPs, limiting emissions of formaldehyde; however, turbines located on the North Slope are exempt from the requirements of this subpart, except for the initial notification requirements.

9.2.5.7 The Federal Greenhouse Gas Reporting Rule

EPA's Greenhouse Gas Monitoring Recordkeeping and Reporting Rule (40 C.F.R. Part 98) requires reporting of GHG emissions from suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit greater than or equal to 25,000 metric tons of GHG (as CO_2e) per year. The potential CO_2e emissions from the Liquefaction Facility will exceed 25,000 metric tpy; therefore, it will be subject to the GHG reporting rule. Other project emissions sources will also be assessed against the 25,000 tpy threshold. Reporting will be required for the first year of operation, and a report needs to be submitted on EPA's electronic database by March 31 of each year for the previous calendar year's emissions.

9.2.5.8 General Conformity with Non-Attainment SIPs

Promulgated under 40 C.F.R. Part 51 Subpart W and 40 C.F.R. Part 93 Subpart B, the General Conformity Rule is used to determine if non-transportation-related federal actions meet the requirements of the CAA and the applicable SIP by ensuring that air emissions related to the action do not cause or contribute to new violations of a NAAQS or increase the frequency or severity of any existing violation of a NAAQS or interim emission reduction. A General Conformity Determination is required for federally sponsored or federally approved actions in non-attainment areas, or in certain maintenance areas, when the total direct and indirect net emissions of non-attainment pollutants (or their precursors) exceed specified thresholds (40 C.F.R. § 93.153). This regulation ensures federal actions conform to the SIP and state attainment plans.

The proposed Project is not within a non-attainment or maintenance area, and thus the General Conformity Rule will not apply.

9.2.5.9 Federal Marine Vessel Regulations

Several regulations could potentially apply to marine vessels ranging from small service vessels to ocean-going vessels. Emission standards and certification requirements are provided in 40 C.F.R. Parts 89, 94, and 1042, based on engine size and date of manufacture. General compliance provisions are provided in 40 C.F.R. Part 1068 with further regulations in 40 C.F.R. Part 1043 related to implementing Marine Pollution (MARPOL) Protocol for in-use fuels.

The applicability of MARPOL to Project-related marine vessels will be summarized in a subsequent draft of this Resource Report when more specific vessel information is available.

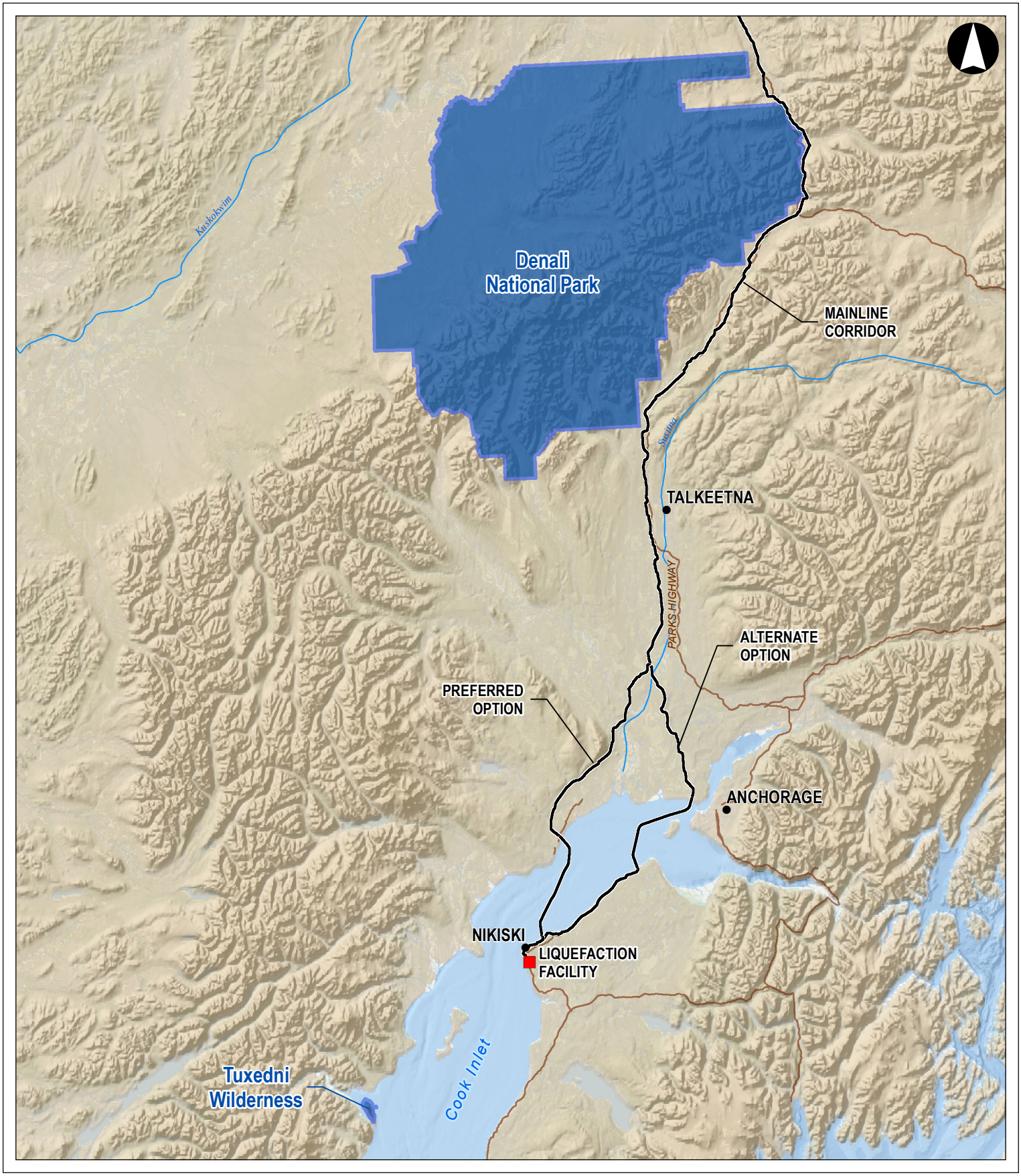
9.2.6 Class I Areas

Under the CAA, certain lands are designated as Class I Areas. Class I Areas are so designated because their air quality is considered a special attribute of these locations (e.g., national parks, wilderness areas). Class I Areas have more stringent requirements for incremental changes in criteria pollutant concentrations, impacts on visibility, and acidic deposition.

There are four Class I areas in the State of Alaska (EPA 2011b):

- Bering Sea Wilderness Area;
- Denali National Park;
- Simeonof Wilderness Area; and
- Tuxedni Wilderness Area.

As shown on Figure 9.2.6-1, all of the permanent operating facilities of the Project are located at substantial distances from the Class I areas, with the exception of the Mainline corridor. The Liquefaction Facility is estimated to be approximately 50 miles (80 km) from the Tuxedni Wilderness Area, which is southwest of the Liquefaction Facility and across Cook Inlet. LNG carrier traffic traversing Cook Inlet could travel within approximately 12 to 19 miles (20 to 30 km) of the Tuxedni Class I area. In some areas, the Mainline corridor approaches within less than one-mile of the eastern boundary of Denali National Park.



VICINITY MAP

LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- Class 1 Airsheds

0 25 50 Miles

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AIR QUALITY CLASS I AREAS IN THE PROJECT VICINITY

FIGURE 9.2.6-1

Alaska LNG

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9.2.6.1 Regional Haze Rule

The federally mandated Regional Haze Rule (40 C.F.R. 51 Subpart P) establishes regulations to improve and protect visibility in designated Class I areas (see Section 9.2.6 below). For new sources, the program is implemented through 40 C.F.R. Subpart P §53.307 as part of the existing NSR Program for major sources and major modifications.

The EPA adopted the Regional Haze Rule to protect visibility in Class I areas. The rule lays out the specific requirements to ensure improvements in visibility in Denali NP and other large national parks and wilderness areas across the country through the mitigation of human-caused air pollution impacts. The Regional Haze Plan describes how the State of Alaska will meet federal requirements to measure and monitor visibility, aerosols, and air pollution at Alaska's four Class I areas, how Alaska will evaluate the factors reducing visibility at each site, and how Alaska plans to identify and implement air pollution control measures on a case-by-case basis to reach natural visibility conditions by the 2064 Regional Haze Rule target date.

ADEC is required to notify the appropriate federal land manager of any proposed PSD major project that has the potential to impact a Class I area (generally within 62 miles (100 km) of the Class I area); such notification must include an analysis of the project's impact on visibility in the Class I area. Impacts are assessed to ensure continued "reasonable further progress" toward attaining visibility goals in the Class I areas. Compliance can require visibility monitoring as well as the imposition of control technologies based on cost and other factors. Analyses would generally be completed as part of the PSD application.

9.2.7 Potential Construction Emissions, Impacts, and Mitigation Measures

Impacts to air quality from Project construction will include temporary emissions from construction equipment and support operations (e.g., construction camps), as well as fugitive dust. A general summary of potential impacts to air quality from construction of projects similar to this Project is provided in Appendix A. This appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to air quality by the (1) Liquefaction Facility and (2) Interdependent Facilities. Included will be a discussion of proposed plans and measures, including any site-specific measures.

9.2.8 Potential Operational Impacts and Mitigation Measures

Impacts to air quality from Project operations will include emissions from facility equipment and marine vessels. A general summary of potential impacts to air quality from operation of projects similar to this Project is provided in Appendix A. This appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to air quality in the vicinity of the (1) Liquefaction Facility and (2) Interdependent Facilities. Included will be a discussion of proposed mitigation measures, including site-specific measures.

9.3 CLIMATE CHANGE

Observations of climate trends in Alaska and the Arctic region have been well documented in recent years. The causes of global climate change include many factors, and the nature of climate change is

affected by complex feedbacks within the earth-atmosphere-ocean system that both enhance and impede global climate change. Many of these changes are undergoing extensive research, and the results may play a role in developing a deeper understanding of climate change and its relation to local climate trends.

A subsequent draft of this Resource Report will incorporate detailed Project design data and address applicable requirements and relevant issues. Evaluations of these issues will be based largely on well-documented studies that are based on scientific consensus and rigor regarding climate change.

9.4 NOISE

This section describes the existing noise environment of the Project area and assesses potential noise impacts related to Project construction and operation. The information provided relates to the human environment. Potential impacts on fish, wildlife, and marine mammals are discussed in Resource Report No. 3.

9.4.1 Regulatory Requirements for Noise

9.4.1.1 Federal

At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions, but also by the effects of seasonal groundcover and other activity. Two measures used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level (L_{eq} (24)) and the day-night average sound level (L_{dn}). The L_{eq} (24) is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The L_{dn} is the L_{eq} (24) with 10 decibels added to the nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

In 1974, the EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." This publication evaluated the effects of environmental noise with respect to human health and safety. EPA identified an L_{dn} of 55 dBA as a threshold for outdoor noise in residential areas (EPA, 1974). This noise level is often used by federal and state agencies to establish noise limitations for cumulative noise exposure. With a 10 decibel nighttime weighting penalty, a 55 dBA L_{dn} noise level equates to a 24-hour continuous noise level of 48.6 dBA L_{eq} (24). FERC limits the noise attributable to stationary energy facilities (such as compressor stations) to 55 dBA L_{dn} at noise-sensitive areas (NSAs) such as schools, hospitals, or residences.

The U.S. National Park Service (NPS) and the U.S. Fish & Wildlife Service (USFWS) manage lands near the Project and may have an interest in potential noise impacts. (Figure 9.4.1-1). A discussion and mapping of federal lands in the vicinity of the Project are provided in Resource Report No. 8. The NPS does not have a numeric noise criterion for human exposure applicable to the Project. However, the NPS has a Soundscape Management Policy that states, "Using appropriate management planning, superintendents will identify what levels and types of unnatural sound constitute acceptable impacts on park natural soundscape. In, and adjacent to parks, the NPS will monitor human activities that generate noise that adversely affects park soundscapes, including noise caused by mechanical or electronic devices (NPS, 2006)." As shown in Figure 9.4.1-2, the Denali National Park and Preserve, managed by NPS, is adjacent to the Mainline corridor.

The USFWS does not have a numeric noise criterion for human exposure applicable to the Project. USFWS does preserve "natural soundscapes" as an "aspect of wilderness character" to "prevent or minimize…unnatural sounds that adversely affect wilderness resources or values or visitors' enjoyment of them (USFWS, 2008)." Four National Wildlife Refuges (NWR) managed by USFWS are near the Mainline corridor: Arctic NWR, Yukon Flats NWR, Kanuti NWR, and Kenai NWR.

9.4.1.2 State

The State of Alaska has not adopted noise regulations applicable to the Project. In the absence of an applicable state noise level limit, the FERC noise criterion of 55 dBA L_{dn} will be used to ensure the Project's compliance with noise regulatory requirements.

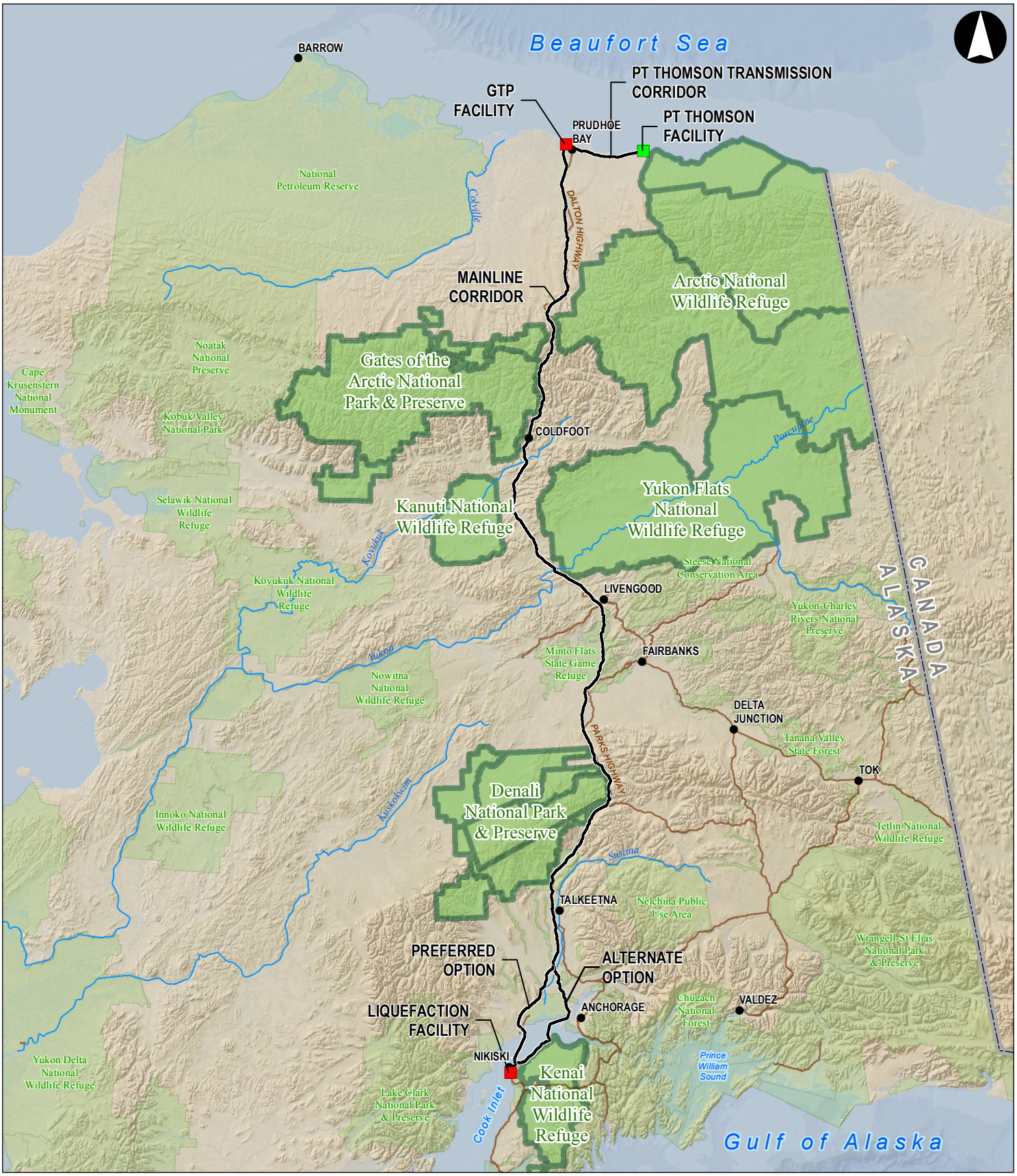
9.4.1.3 Local

Except for the Matanuska-Susitna Borough (MSB), none of the local jurisdictions have adopted noise regulations applicable to the Project.

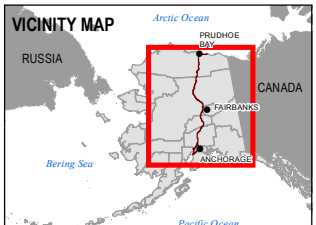
The MSB has a noise standard that limits noise for Core Area Conditional Use Permits according to the applicable zoning district classification (e.g., residential, commercial, industrial) of the noise source and the NSAs (MSB, 2013). A portion of the Mainline corridor is located in the MSB area and would be considered an industrial entity, but it is over 20 miles from the designated Core Area. Regardless, the FERC criterion of 55 dBA L_{dn} is equivalent to a 24-hour continuous noise level of 48.6 dBA L_{eq} (24), which is less than the 60 dBA daytime and 50 dBA nighttime limits of the MSB. Thus, the more stringent FERC noise criterion of 55 dBA L_{dn} will be applicable to the Project.

9.4.2 Existing Noise Levels

The majority of the Project area is located in undeveloped, sparsely populated areas; therefore, ambient noise levels are anticipated to be generally low. However, a portion of the Project area is located in residential, agricultural, or commercial areas and may have a slightly higher ambient noise level.



VICINITY MAP



LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- State and Federal Conservation Lands

0 35 70 140 Miles

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_4_1-1 Project Vicinity to Nearby NPS and USFWS Conservation Units.mxd

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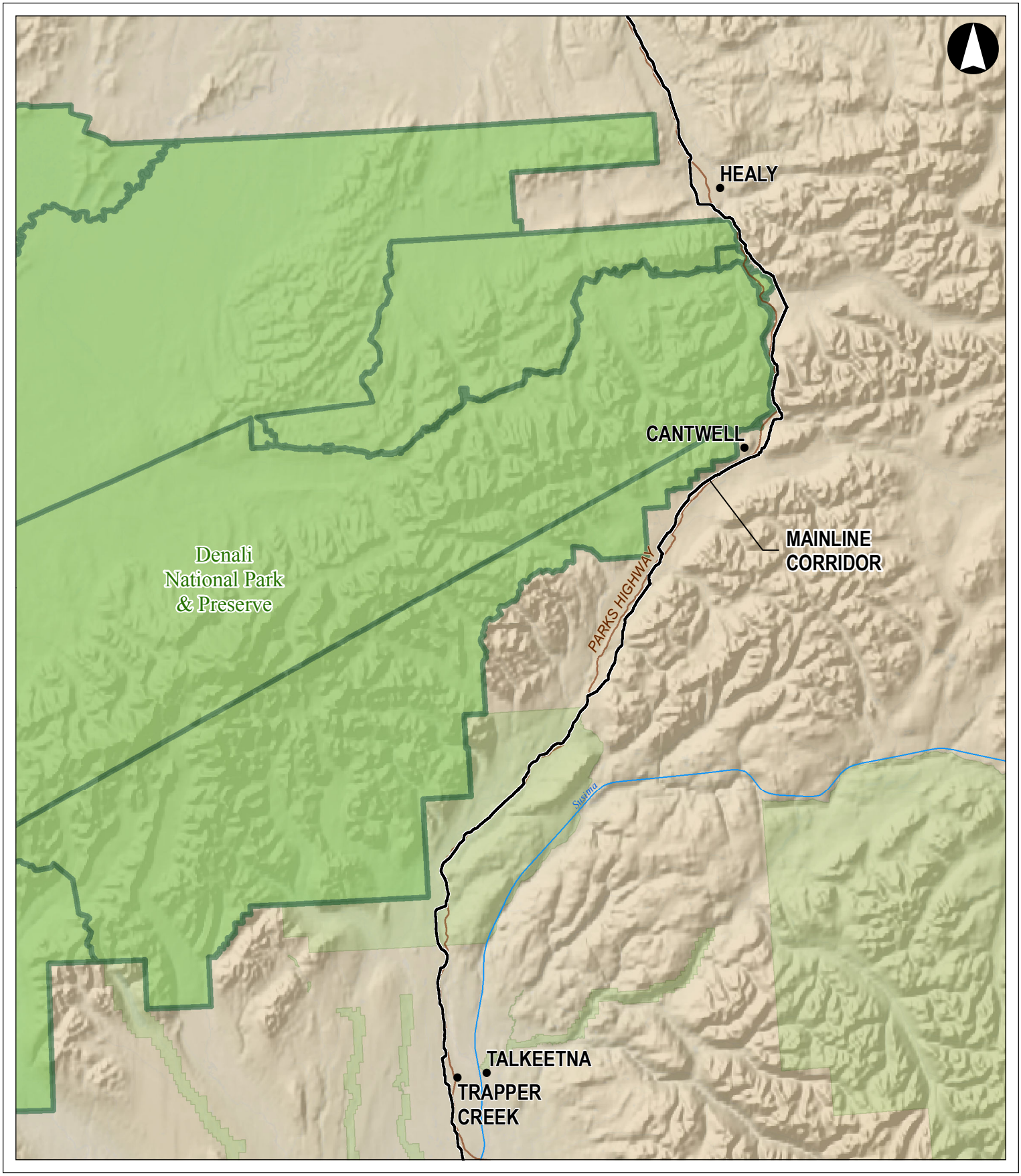
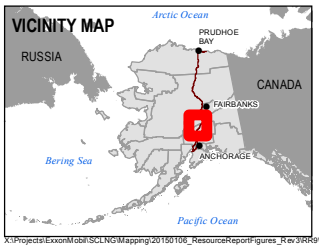
PROJECT VICINITY TO NEARBY NPS AND USFWS CONSERVATION UNITS

FIGURE 9.4.1-1

Alaska LNG



VICINITY MAP



LEGEND

- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- State and Federal Conservation Lands

0 5 10 20 Miles

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PROJECT AREA IN PROXIMITY TO DENALI NATIONAL PARK

FIGURE 9.4.1-2

Alaska LNG

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR9\Figure 9_4_1-2 Project Area in Proximity to Denali Park.mxd

Existing noise level information was compiled from:

- A preliminary noise assessment in the area of the Liquefaction Facility;
- The Alaska Pipeline Project's (APP's) GTP study; and
- The Alaska Stand Alone Gas Pipeline's Final Environmental Impact Statement.

In addition to this information, site-specific 24-hour baseline noise surveys will be conducted for the Project (summer and winter) and provided in a subsequent draft of this Resource Report.

9.4.2.1 Liquefaction Facility

Existing sound levels in the area of the Liquefaction Facility are estimated to be between approximately 35 and 70 dBA L_{dn}. Available GIS data indicate that approximately 440 residential receptors and one recreational campground receptor are located within one mile of the Liquefaction Facility. These receptors will be classified as NSAs.

A Noise Monitoring Protocol document will be developed to establish the baseline monitoring methodology and monitoring locations that will be used for the collection of baseline data once the Liquefaction Facility's footprint has been established. The baseline noise level data and identified NSAs will then be summarized in a subsequent draft of this Resource Report. The baseline sound survey report(s) will also be included as an appendix to this Resource Report.

Marine Vessels

LNG carrier routes have not yet been finalized; however, it is anticipated that they will be located more than a mile from shore. In addition, there are no onshore NSAs along the Cook Inlet shipping routes. This will be verified during the WSA development in 2015.

9.4.2.2 Interdependent Facilities

Pipeline and Related Aboveground Facilities

The majority of the Mainline corridor is located in undeveloped, sparsely populated areas; therefore, ambient noise levels are anticipated to generally be low with ambient noise levels in wilderness areas anticipated to be approximately 35 dBA (EPA, 1978). However, some areas along the Mainline corridor will be located in more urban and industrial areas with ambient noise levels at approximately 51 dBA L_{dn} (wooded residential) or 59 dBA L_{dn} (suburban residential) (EPA, 1978). Detail pertaining to residential areas and other NSAs potentially affected during construction and operation of the Mainline will be presented in a subsequent draft of this Resource Report once further details are known.

Horizontal Directional Drill (HDD) locations or areas of other special construction techniques (e.g., blasting) are not known at this time. As these locations are identified in the Pre-FEED process, details pertaining to baseline noise levels, nearby NSAs (distance and direction), and site-specific survey reports will be presented in a subsequent draft of this Resource Report. The baseline sound survey reports also will be included as an appendix to this Resource Report.

Aboveground Facilities

The locations of the aboveground facilities (e.g., compressor stations and heater stations) are not known at this time. As facility sites are identified in the Pre-FEED process, details pertaining to baseline noise levels, nearby NSAs (distance and direction), and site-specific survey reports will be presented in a subsequent draft of this Resource Report. The baseline sound survey reports also will be included as an appendix to this Resource Report.

PTTL

The actual footprint of the PTTL will be identified during the Pre-FEED process. The pipeline will be constructed in an area of open land and commercial / industrial land use. As facility sites are refined, NSAs potentially affected during construction and operation will be identified and presented in a subsequent draft of this Resource Report.

PBTL

The actual footprint of the PBTL will be identified during the Pre-FEED process. The pipelines will be constructed in an area of open land and commercial/industrial land use. As facility sites are refined, NSAs potentially affected during construction and operation will be identified and presented in a subsequent draft of this Resource Report.

GTP

No NSAs have been identified within one-mile of the GTP area, including the West Dock. A series of ambient noise level measurements were conducted in the vicinity of the GTP from April 9 through April 14, 2012, as part of the Alaska Pipeline Project (APP). As part of the APP's study, five long-term noise measurement locations were selected as shown in Figure 9.4.2-1. The primary noise sources identified for these long-term locations consisted of the nearby oilfield facilities, local traffic, and wind. Noise levels remained fairly consistent for the duration of the study, but peaked with wind gusts, as well as when vehicles passed by. Sound levels were measured to be between 52.2 and 65.7 dBA L_{dn}. The baseline sound survey reports also will be included as an appendix to a subsequent draft of this Resource Report.

9.4.3 Potential Construction Impacts and Mitigation Measures

Noise level considerations for impacts related to Project construction generally include the following:

- Type of construction equipment used;
- Construction duration;
- Time of day; and
- Distance to NSAs.

LEGEND

- 2012 Winter Noise Monitoring Locations
- Proposed GTP Footprint

0 0.25 0.5 1 Mile

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GTP NOISE ASSESSMENT LOCATIONS

FIGURE 9.4.2-1

Alaska LNG

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A general summary of potential impacts to noise levels from construction of projects similar to this Project is provided in Appendix A. This appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to noise levels by the (1) Liquefaction Facility and (2) Interdependent Facilities. Included will be a discussion of proposed plans and measures, including any site-specific measures.

9.4.4 Potential Operational Impacts and Mitigation Measures

Noise level considerations for impacts related to Project operations generally include the following:

- Facility design;
- Type of equipment used; and
- Distance to NSAs.

A general summary of potential impacts to noise levels from operation of projects similar to this Project is provided in Appendix A. This appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to noise levels in the vicinity of the (1) Liquefaction Facility and (2) Interdependent Facilities. Included will be a discussion of proposed mitigation measures, including site-specific measures.

9.5 REFERENCES

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APPENDIX A GENERAL IMPACTS FROM SIMILAR PROJECTS IN ALASKA

Potential Impact	Project Activity												*Potential Plans to Address Impacts
	Grading, Clearing, Excavating (incl. Blasting), Trench, Pipelay, Backfill, Reclamation	Water Crossings (Pipelines & Bridges)	Ice Roads & Pads	Erosion Control & Drainage Control	Water Withdrawal & Usage	Water Discharge	Solid Waste Storage & Disposal	General Infrastructure Activities	Facility Construction	Facility Operations	Offshore Construction	Resource Report No.	
Air Emissions (including dust) from Construction	X	X	X	X	X	X	X	X	X		X	1, 9	C, J, O, T, W
Air Emissions from Operations										X		9	J, W, LL
Surface Water Quality Impacts (Increased Turbidity [TSS] / Sedimentation in Surface Water)	X	X	X	X	X	X	X	X	X	X	X	2, 3, 7	G, H, J, T, V, Y, II, KK
Contamination Migration	X	X				X	X	X		X		1, 2, 3, 7	G, I, GG
Disruption / Loss of Wildlife, Fish or Marine Mammal Habitat	X	X	X	X	X	X		X	X	X	X	2, 3	A, B, C, G, H, K, N, R, V, DD, EE, JJ
Disturbance & Vessel Strikes from Vessel Traffic								X		X	X	3	B, N
Disturbance of Known Historic Archaeological or Architectural) and Paleontological Resources	X	X	X					X	X		X	1, 4, 6, 7	C, D, E, Z, AA
Erosion	X	X		X		X			X		X	1, 2, 6, 7, 8	G, H, II, KK
Groundwater Impacts (Withdrawal, Drawdown, Vertical & Horizontal Hydraulic connectivity, Wells)	X	X	X		X				X	X		1, 2	Y, MM
Hazards to Aviation								X	X	X		1, 11	M
Hazards to Marine Navigation		X						X			X	1, 11	B, M
Inadvertent HDD Mud Release		X										1, 2, 3, 7	I
Incidental Take of Wildlife, Birds, & Marine Mammals	X	X	X		X	X	X	X	X		X	3	A, B, C. F, G, H, N, R
Increased Surface Water Runoff	X			X		X			X	X		2, 3, 7	Y, II
Introduction of Non-native Species	X	X	X			X		X	X	X	X	2, 3	G, K, KK
Impact to Public Use or Public Land	X	X						X	X	X	X	1, 2, 3, 8	B, F, H, L, BB, CC, FF
Impacts to existing infrastructure	X							X	X	X	X	1, 2, 3, 7, 8	M, S, U
Construction Noise Impacts	X	X						X	X			3, 9	C, F, P, N, FF, JJ
Operational Noise Impacts										X		9	F, P, FF
Potential Impacts to Vegetation, Wildlife, Fish, Birds, & Threatened Species	X	X	X	X	X	X	X	X	X	X	X	1, 2, 3, 6, 7, 8, 9	A, C. G, H, K, Q, R, T, DD,EE, JJ
Fish passage impacts		X										3	H, DD, JJ
Reduced Surface Water Recharge Rates	X		X		X	X						2, 3, 6	V, Y, MM
Watercourse Realignment and Scouring		X		X		X		X	X			2	G, H, V
Seismic Hazards / Mass Wasting, Soil Liquefaction	X	X						X	X	X	X	1, 6, 11	X
Tundra Degradation, Thermokarst	X	X	X	X	X				X	X		2, 3, 6, 7	G, X, KK
Unanticipated Discovery of Cultural Resources	X	X	X					X	X		X	1, 4	D, E
Unanticipated Discovery of Paleontological Resources	X	X						X	X		`	1, 4, 6	C, Z, AA
Unplanned spills/releases		X							X	X	X	2	G, I, HH, II
Vegetation & Topsoil Degradation or Loss	X		X	X				X				3, 7	G, II, KK

Potential Impact	Project Activity												*Potential Plans to Address Impacts
	Grading, Clearing, Excavating (incl. Blasting), Trench, Pipelay, Backfill, Reclamation	Water Crossings (Pipelines & Bridges)	Ice Roads & Pads	Erosion Control & Drainage Control	Water Withdrawal & Usage	Water Discharge	Solid Waste Storage & Disposal	General Infrastructure Activities	Facility Construction	Facility Operations	Offshore Construction	Resource Report No.	
Vertical and Horizontal Hydraulic Connectivity of Ground Water and Surface Water (Groundwater Discharge to Surface Water)	X	X	X		X	X			X		X	2, 3	C, G, X, Y, MM
Visual Impacts	X	X					X	X	X	X	X	1, 8	L, V, CC
Waste from Construction and Operations - Liquid and Solid, Hazardous and Non-Hazardous									X	X		2, 8	T
Impacts to Wetlands – footprint and functionality									X			2	DD, EE
***Potential Plans to Address Activity**	**A, C, D, E, G, K, L, O, P, R, Z, GG, II, KK**	**D, E, G, H, I, K, L, O, V, Y, DD, EE, II, JJ**	**G, L, O, R**	**G, L, O, V, II, KK**	**G, L, O, MM**	**G, K, L, O Y, MM**	**G_T O, T, Y, GG, HH**	**D, G, M, O, R, S, HH, II**	**D, E, F, G, K, M, P, R, S, T, W, X, Z, FF, GG, HH, JJ, II, MM**	**F, HH, J, K, O, P, R, T, W, FF, MM**	**D, E, G, M, N, O, P, Q, R, W**	**All**	

List of Potential Plans*

A.	Avian Protection Plan
B.	Marine Logistics Shipping Plan
C.	Blasting Plan
D.	Unanticipated Cultural Resource Discovery Plan
E.	Cultural Resources Data Recovery Plans and/or Treatment Plans
F.	Ambient Noise Level Studies
G.	FERC 2013 Wetland and Waterbody Construction and Mitigation Procedures with Requested Project-Specific Variances (the Applicants' Procedures) AKLNG Procedures
H.	Site-specific Waterbody Crossing Plans
I.	HDD Inadvertent Release Plan (Project Specific HDD Contingency Plan)
J.	Health Impact Assessment
K.	Invasive Species Mitigation Plan
L.	Public Land Construction Plan
M.	Project Logistics Plans
N.	Marine Mammal Mitigation and Monitoring Plan
O.	Mobile Emissions Control Plan
P.	Noise Control and Mitigation Plan
Q.	Plan of Cooperation (POC)
R.	Polar Bear and Wildlife Interaction Plan
S.	Project Transportation Plan
T.	Project Waste Management Plan
U.	Project-specific Railroad crossing Plans
V.	Riparian Buffer Planting Plan
W.	Modeling Site-specific Impacts to Air Quality Emissions
X.	Site-specific Geohazards Plan
Y.	Water Monitoring Plan
Z.	Unanticipated Paleontological Discovery Plan
AA.	Paleontological Resources Management Plans
BB.	Site-specific Public Land Use and Recreational Use Coordination Plans
CC.	Visual Aesthetics Study
DD.	Site-specific Wetland Resources Crossing Plans (as required)
EE.	Wetland Mitigation Plans
FF.	Site-specific Noise Mitigation Plans (as required)
GG.	Unanticipated Contamination Discovery Plan
HH.	Spill Prevention, Control, and Countermeasure Plan (SPCC)
II.	Storm Water Pollution Prevention Plan (SWPPP) – general and spread specific
JJ.	Species-specific Wildlife Protection Plan
KK.	FERC 2013 Upland Erosion Control, Revegetation, and Maintenance Plan with Requested Project-Specific Variances (the Applicants' Procedures) AKLNG Plan
LL	Design/Operations Emissions Management Plan
MM	Groundwater Management Plan

* In addition to the potential plans listed above, FERC requires implementation plans that outline how the Project will meet all required environmental permits and stipulations. The applicants will also prepare overarching Construction Environmental Management Plans and Operations Environmental Management Plans for the Project.